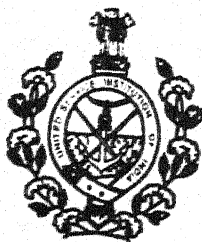


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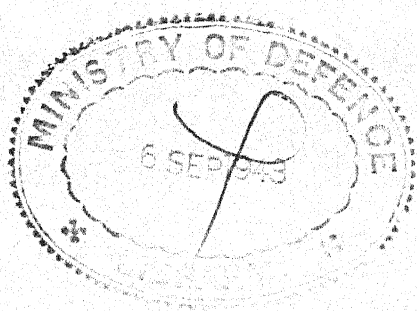
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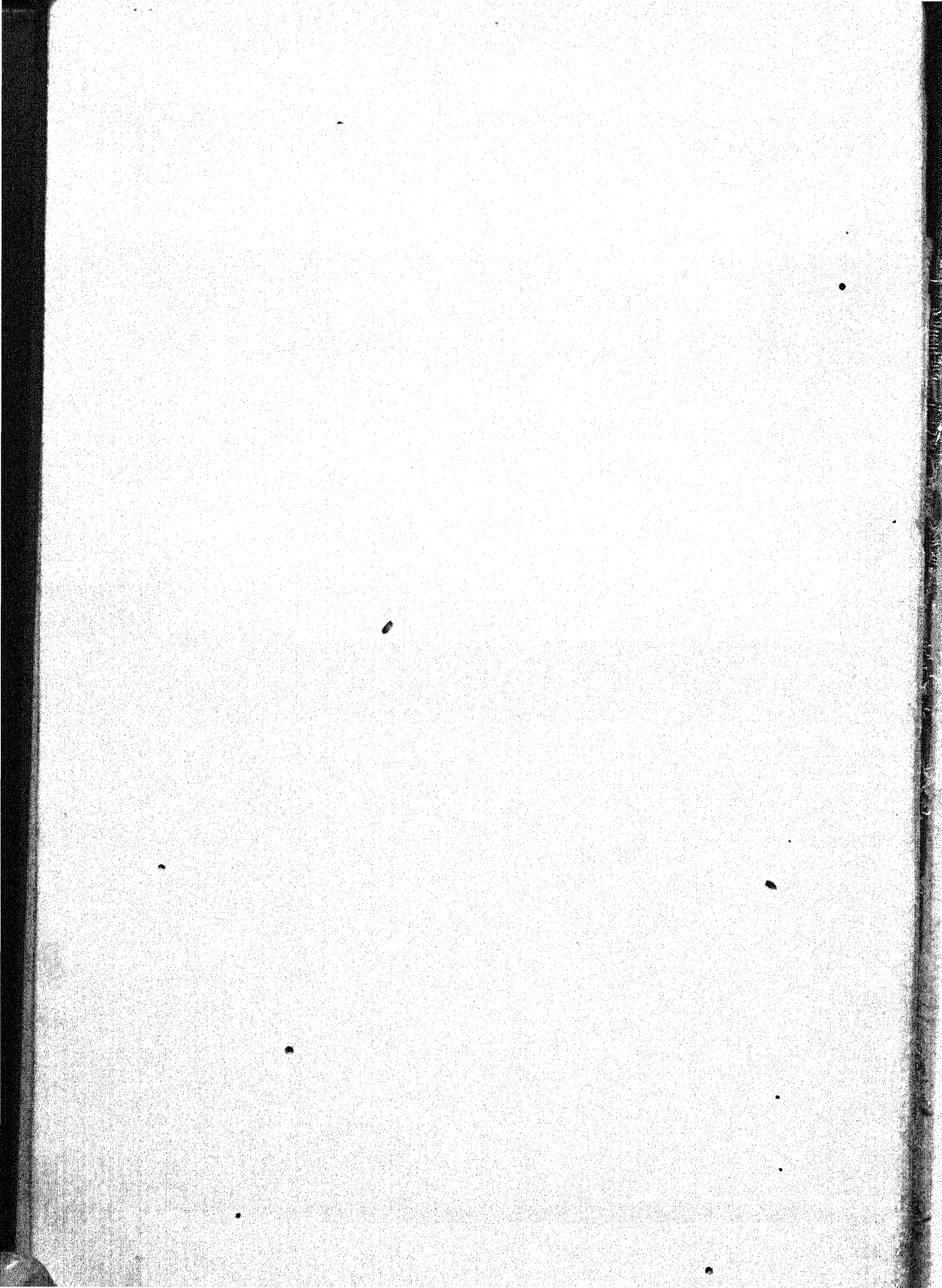
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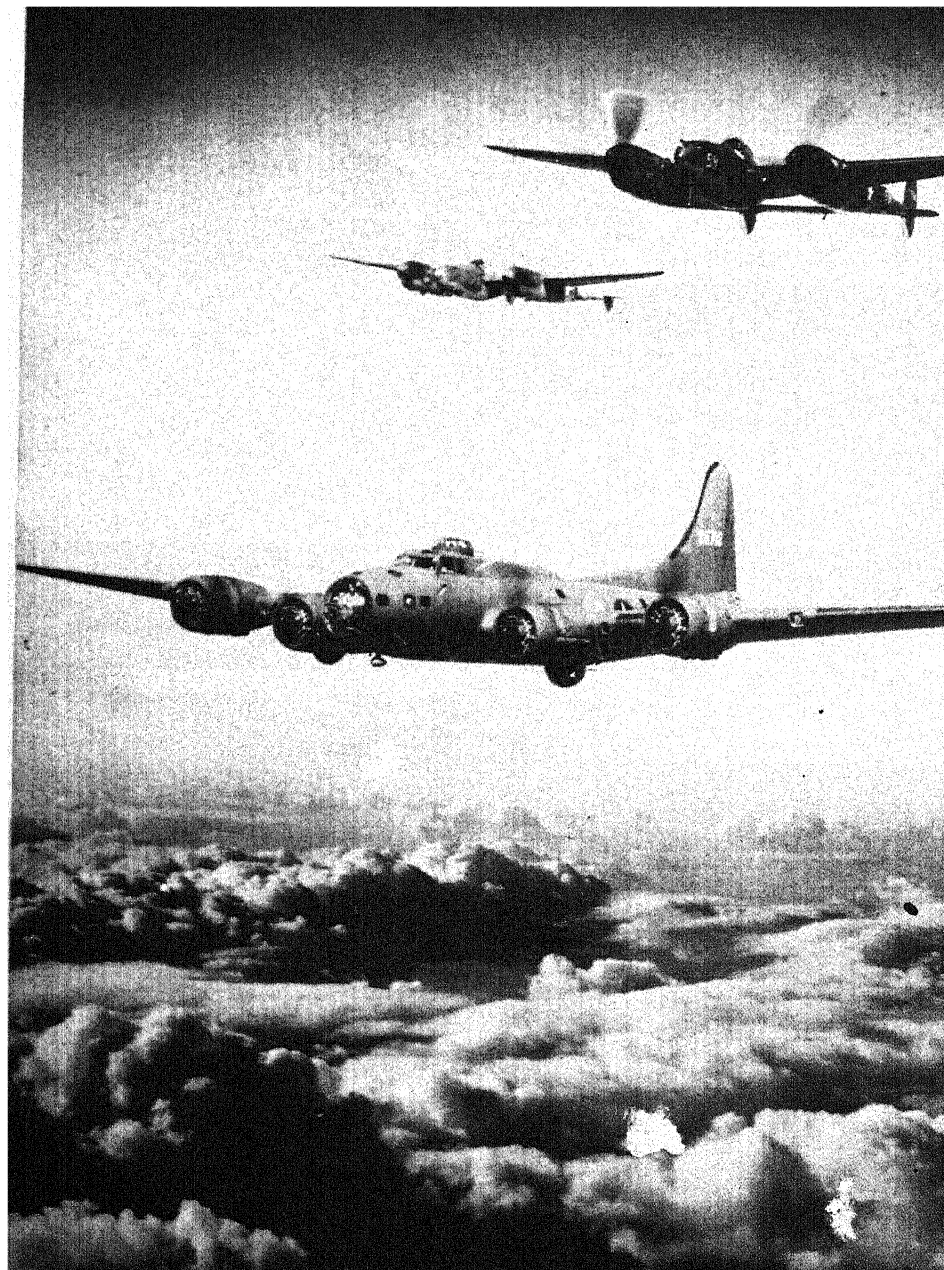
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AMERICAN WARPLANES



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AMERICAN WARPLANES

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by
ELIZABETH MALLET CONGER

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HENRY HOLT AND COMPANY · NEW YORK

UNITED SERVICE INSTITUTION
OF INDIA, NEW DELHI
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TO

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BETTY JANE WITHERHEAD

INTRODUCTION

THIS book is about Army and Navy airplanes and the brave men in our air forces who fly them. Our country is at war, and, in time of war, the planes that are fighting for us are more important than any other airplanes. The United States has very fine fighting planes and very brave pilots.

We all wish to know everything we can about our fighting planes. The Army and the Navy are glad to tell us as much as they can about them. They like to have us know the names of the planes that we see flying above us. They like to have us learn the many interesting things each plane can do.

But some things about the planes of our U. S. air forces must be kept secret. This is because the Army and the Navy do not want our enemies to know all about our planes. Of course, none of these secrets are in this book. Everything that you read here is what the Army and the Navy are glad to have us know.

You will read in this book about a great many airplanes, but even these are not all we have. A book about every airplane in our country would be too big to hold. In choosing the planes for this book, boys and

girls have helped. They chose the ones they like best and they said what they wished to know about each plane.

If you do not find all of your favorites here, why not make your own book of airplanes? In your scrapbook you could paste pictures and stories, from newspapers and magazines, of all the planes you like. You could put new airplanes in your scrapbook, too. Every day new planes are being built. Every day changes are being made in the older planes in order to make them still better. Stories of these changes will be interesting to have, along with the new planes. In this way you will keep up to date in the planes of our Army and Navy.

When the war is over and peace is here, our fighting airplanes will be peace planes. Then we shall use them to help the people in other countries who are cold and sick and hungry. People will be glad to see our airplanes for they will know that we are bringing them clothes and food and medicine.

After the war, we shall all be able to fly to any country in the world in just a few hours. We shall travel in airplanes and we shall be at home in them because we are finding out so much about them now.

AUTHOR'S ACKNOWLEDGMENT

IN the preparation of this book I have felt indebted to several people for their help and kindness.

First I want to thank Dr. Stella S. Center for her friendly co-operation and warm encouragement. That the book came into being is in large part due to the stimulus of her enthusiasm. I wish to thank Miss Gladys L. Persons for reading the manuscript and for giving me the Liberator story. To Mrs. Katherine Young Wood I am especially grateful for editorial assistance, and I wish to thank, also, these friends who have patiently answered questions and who have procured material for me: Miss Louisa King, Lieutenant Colonel Paul Meyers, Colonel George A. Vaughn, Jr., Mr. A. Leslie Meyers of *Aviation Magazine*, Mr. John Mallett of the Sperry Gyroscope Company, the librarians of the Institute of the Aeronautical Sciences, Mr. William S. Friedman and Mr. J. Paul Andrews of *Air News*.

My very warm thanks go to John Highberger who has brought me a great deal of material and who has helped in the selection of the illustrations.

The story of the Liberator is based on an article in *The Consolidated News*, San Diego, California, December 10, 1942. The story of the Flying Fortress is taken from an editorial in the *New York Times*, November, 1942, and the account of the Vega Ventura comes from *Air Age*, August, 1943.

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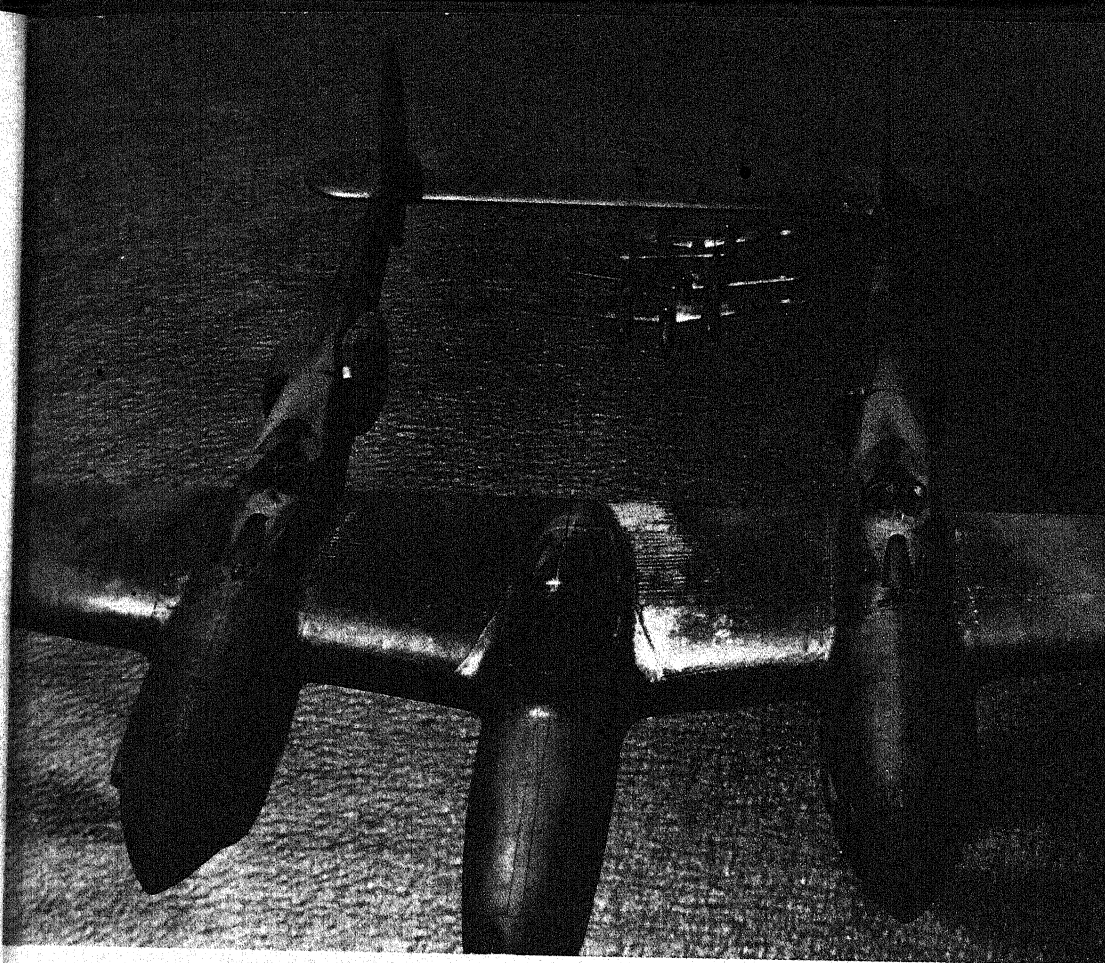
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PART I

Divisions of the United States Army
Air Force





Lockheed Lightnings in Formation

Chapter 1 · THE FIGHTERS

THE United States Army air force has three parts. One part is made up of fast fighting airplanes. One part is made up of bombers. Another part is made up of airplanes that work with the ground forces.

The fast fighting airplanes of the Army are called fighters. These fast fighters have three jobs to do. They must attack enemy bombers when the bombers come to raid. They must attack other enemy fighting planes.

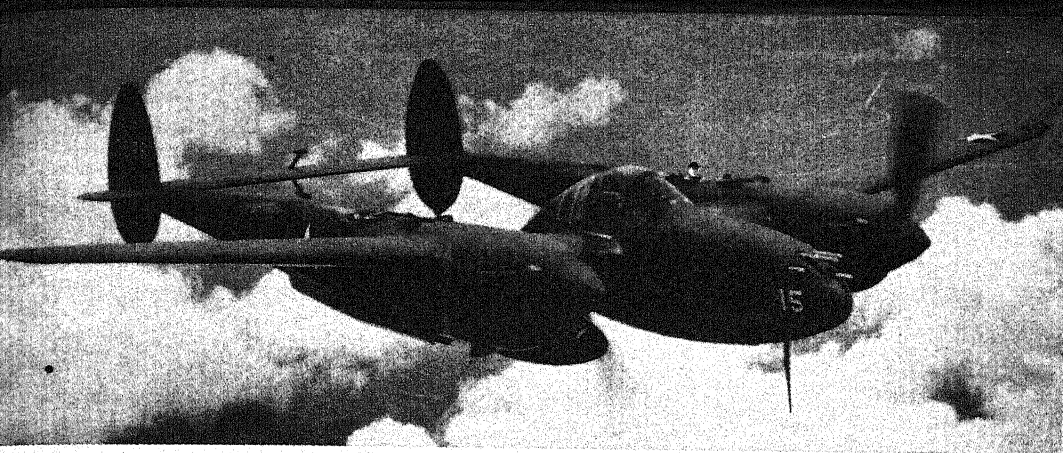
They must go with their own bombers to fight any planes that attack the bombers.

The fighter that stays at home to attack enemy bombers is called an interceptor. The interceptor waits at its base. It is told when an enemy bomber is coming. Before the enemy bomber can get to his target, the interceptor must stop him. The interceptor must climb fast and fly very high in the air. It must fight when it is up 30,000 feet above the ground. It must have good guns and good armor. The interceptor does not carry very much gasoline. It must be light when it climbs and it does not plan to go very far from its base.

The fighters that go out with our bombers carry more gasoline than interceptors. They plan to go over enemy country. These fighters try to keep the enemy fighters from attacking our bombers. They fight best when they are around 20,000 feet up in the air.

All fighters have to be ready to fight the enemy. The interceptors are going to fight very high in the air. Some fighters are going to fight close to the ground. They may help the ground forces. Some fighters will fight between the high fliers and the low fliers. They will fight at around 20,000 feet up in the air. We do not expect each airplane to do all kinds of fighting. We must remember that each airplane was made to do its own work best.

Some of our best fighters are the Lightning, the Thunderbolt, the Mustang and the Warhawk.



Lockheed Lightning, P-38

THE LOCKHEED LIGHTNING • P-38

One of our best high-flying fighting planes is called the Lightning. It is made by the Lockheed Company. Its Army number is P-38.

The Lightning is an airplane that stops enemy bombers. It is an interceptor. It must take off quickly and rise very fast to shoot down enemy bombers. That is why the Lightning must have so much speed and power.

The Lightning is one of the fastest fighting airplanes in the world. It has two engines with 12 cylinders and 1,425 horsepower. These engines are liquid-cooled. The Lightning can fly faster than 400 miles an hour.

This plane flies well very high in the air. It can fight at 30,000 feet and even higher. The thing that makes the Lightning such a deadly fighter is that it can keep its speed when it is so high.

Even with its great speed, the Lightning is easy to fly. Pilots say that this plane can go into a roll or a loop

by just tipping its nose. Many other planes have to be nosed into a half-dive before they can go into a roll or a loop. This means that in a fight the Lightning can turn and get away in a flash.

One of the best things about the plane is its speed in climbing. Pilots are always surprised when they see how fast it can rise from the ground. This plane can get 3,000 feet into the air in less than a minute after taking off.

The Lightning is very well fitted for fighting. There are at least four machine guns and a cannon in the nose of the plane. All guns are placed so that they do not have to be geared down to the speed of the propeller. This means that they fire more bullets each second than the guns of most planes. No airplane flying today can stand up against the full firing power of the Lightning.

In the first part of the war we did not have many chances to use the Lightning. Its real job is to stay up high over its own home ground and knock down raiding enemy bombers. We must remember that it was built to be an interceptor fighter.

Now we are using the Lightnings in many fights. The Army tells us that Lightnings had been fighting in North Africa since September 1, 1942. They had been flying above the Boeing Flying Fortresses to make them safe from German attacks. The Lightnings flew so high that often the Germans did not see them.

The Lightnings can carry more gasoline than most interceptors. Because of this, they are doing very well as fighting planes with long range. They are used also as long-range airplanes for taking pictures, and even as bombers.

The war is showing us every day that Lightnings can do many things even though they were made to be interceptors.

THE REPUBLIC THUNDERBOLT · P-47

The airplane which the Republic Company has just made is one of the best interceptors in our country today. It is called the Thunderbolt and its Army number is P-47.

In a test dive the P-47 has gone faster than any Army airplane has ever gone. On December 2, 1942, two Thunderbolts went into dives that reached 725 miles an hour.

The P-47 is so important to the U. S. Army that the Republic Company has put up a new factory just to build P-47 planes.

The U. S. Army is now building several models of fighter planes. The oldest model is the Curtiss P-40, the Warhawk. This airplane flies more than 300 miles an hour and it can do its best work when it is not too high.



Five Republic Thunderbolts, P-47s

The next oldest model is the Bell P-39, the Airacobra. This plane goes 400 miles an hour and fights well at around 15,000 feet up in the air. It can fly above 23,000 feet. The two-engine Lockheed P-38, the Lightning, flies around 400 miles an hour and can fight well when it is higher than 30,000 feet.

The P-47 is one of the best of the U. S. Army fighter planes. It flies 400 miles an hour on a level. It can fight when it is 35,000 feet high. This is where the British Spitfire and the new German Focke-Wulf 190 fight.

There is one very interesting thing about the Thunderbolt. The pilots say that when the airplane is going very fast high up in the air, the guns on its wings turn bright blue. Even Kartveli, the man who first planned

this airplane, does not know why, but he thinks they turn blue because of static electricity.

The P-47 is a very big airplane. It has a bigger engine than any other Army fighter. The P-47 weighs about 13,000 pounds. That is more than six tons. It is at least two tons heavier than any other U. S. Army fighter plane with one engine.

In some ways the P-47 seems almost too big. It cannot turn around so fast as the small planes do. A Japanese Zero plane is very light. It can turn quickly but it has very thin walls. It breaks up easily. There is very little armor to keep the pilot safe. The P-47 has good armor to protect the pilot. The U. S. Army thinks that a heavy plane which can go very fast is better than a small, light plane.

The Thunderbolt has a long range. It can fly 1,000 miles without coming down for gasoline. When it carries extra gasoline tanks it can go much farther.

On May 4, 1943, the Thunderbolts went into their first battle protecting bombers. They flew on a raid over Antwerp. Not one Thunderbolt was lost and not one Allied bomber was shot down.

Since that first battle, the P-47's have been doing very well in many fights with the Focke-Wulf 190's.

THE CURTISS TOMAHAWK, KITTYHAWK, WARHAWK · P-40 SERIES

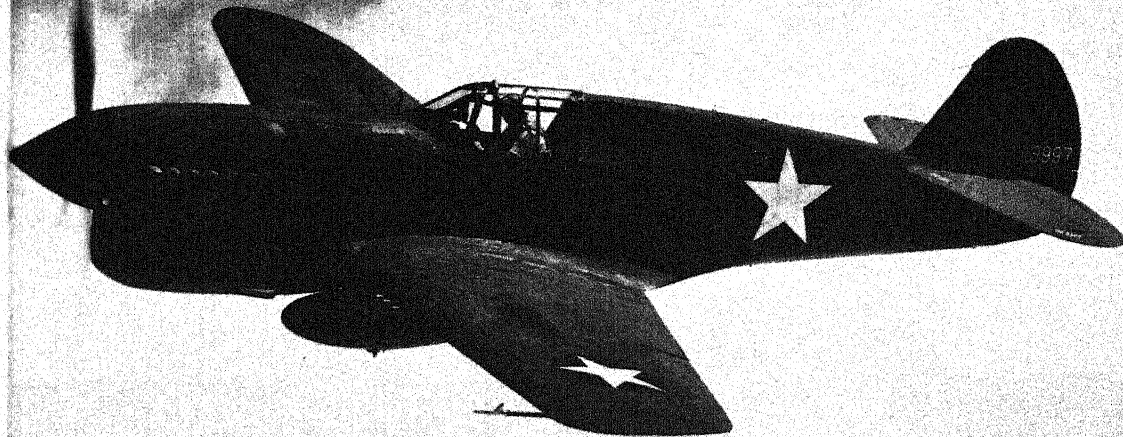
We have read about the P-47 and the P-38. Do you know what P means? P stands for the word "Pursuit." The Army used to call a fast fighter a "pursuit" plane.

The Curtiss Company has put out three or four models called P-40. The first model P-40 is the Tomahawk. Another model, P-40E, is called the Kittyhawk. The next model, P-40F, is called the Warhawk.

THE TOMAHAWK · P-40

The Tomahawk has an Allison engine with 950 horsepower. This engine is liquid-cooled. Before we really used this engine for fighting, we thought that liquid-cooled engines were much better than air-cooled engines. Now we find that liquid-cooled engines are not always so safe. If a bullet hits the engine, the liquid drips out. People are still working on the liquid-cooled engines and we hope to have a better one made soon.

There are many good things about liquid-cooled engines. In some ways they are better for an airplane than air-cooled engines. In the air-cooled engine the cylinders usually go out from the crank shaft like the spokes of a wheel. This engine must be put in the nose of the airplane. It makes the nose blunt and very wide.



Curtiss Warhawk, P-40

This means that the air-cooled engine cannot have such a thin airplane. The blunt nose of an airplane slows down the speed.

The liquid-cooled engine has its cylinders in straight lines down the middle of the airplane. They do not go out like the spokes of a wheel. This engine goes farther down the length of the plane but it is not so wide. The nose of the airplane can be closed and pointed. This gives the airplane a better streamline than the streamline of a plane with an air-cooled engine. A plane with a good streamline can go faster than a plane with a blunt nose because it does not push against the air.

The Tomahawk has a long nose with a row of ex-

haust pipes near the front and a large radiator below. The landing gear folds up under the wings when the plane is flying.

The wings have a dihedral angle. A dihedral angle is made when a line points up from a flat line. In an airplane this means that the wings slant up from the body toward the tips. You will often hear of wings with a dihedral angle. The wings are made this way so that the airplane will not tip easily.

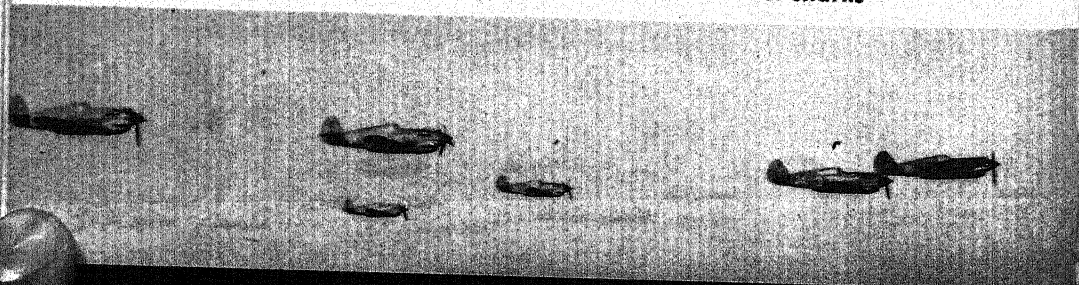
The Tomahawk is not so fast as the Thunderbolt. Its top speed is 350 miles an hour. It cannot fly very high in the air. It fights at around 15,000 feet.

The Tomahawk has enough armor to protect the pilot, but it does not have enough guns. It has only two .50 caliber machine guns and four .30 caliber machine guns. Some of the machine guns fire through the three-blade propeller.

The Curtiss Company is not making any more P-40 Tomahawks. The Tomahawks cannot fly fast enough and they cannot fly high enough for fighter-interceptors. They are used now as low bombers.

The Tomahawks are very famous because they were used by the Flying Tigers. They did very good work in China against the Japanese. We shall read about that later.

Tomahawks in flight do look like a school of sharks



THE KITTYHAWK · P-40E

After the Army had found out the things that were wrong with the Tomahawk, it told the Curtiss Company about them. The Curtiss Company made some changes in the Tomahawk. The Kittyhawk is the P-40E, and it is better in many ways than the P-40 Tomahawk.

The engine of the Kittyhawk has more power than that of the Tomahawk. It is an Allison engine and it is liquid-cooled.

The Kittyhawk cannot fly any higher than the Tomahawk but it carries better guns. It carries, now, six .50 caliber machine guns. These guns are placed on the wings.

THE WARHAWK · P-40F

The Warhawk is the latest of the P-40 models. This airplane is much faster than the Kittyhawk. It has a Rolls-Royce engine with more horsepower. This engine is liquid-cooled but it is an English engine made in America by the Packard Company.

The Warhawk can fly higher than the Tomahawk and the Kittyhawk. It can fight well when it is 25,000 feet up the air. It cannot fly so high as the P-47 Thunderbolt or the Lockheed Lightning, P-38.

The Warhawk carries an extra gasoline tank. This

is called a belly tank. The airplane can go a long way using the gasoline from this tank. When the tank is empty, it can be dropped off. Then the plane can come home using the gasoline from the tank inside. The belly tank gives the plane a chance to go farther without coming down for gasoline.

The Warhawk looks very much like the Tomahawk and the Kittyhawk. All three planes are streamlined, with long noses. They all have a row of exhaust pipes near the front. All of the P-40 models are single seaters and have a dihedral slant to their wings.

THE STORY OF THE FLYING TIGERS

On December 18, 1941, ten Japanese bombers were flying toward a place in China called Kunming. Suddenly fourteen fighter planes came swooping out of the clouds. All the planes began firing. This was a great surprise to the Japanese. They turned back, dropping their bombs in the woods below. Six bombers were shot down but the rest flew home to their base.

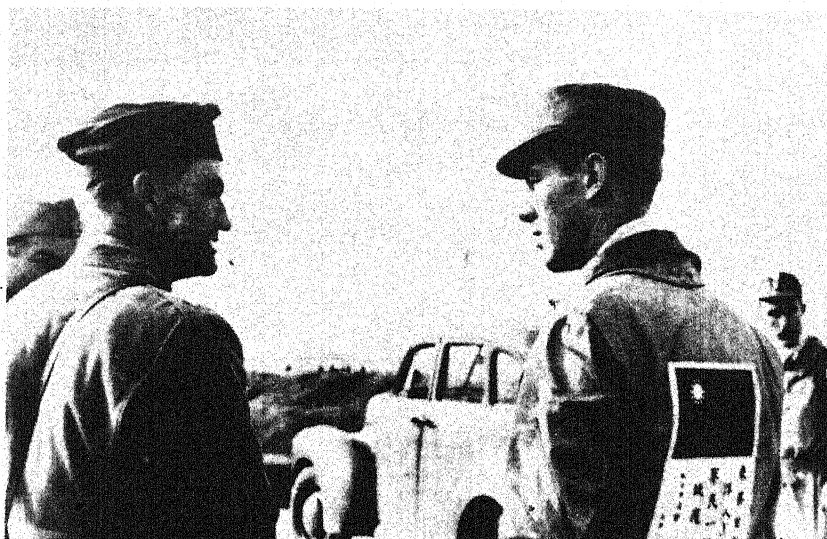
The Japanese were puzzled.

"Who are these strange fighters?" they asked.

The fighters were the Flying Tigers. They were American men who had come to help China. Their real name was the American Volunteer Group of the Chinese Air Force. They were called the A. V. G.

The Flying Tigers never fought another battle with more airplanes than the Japanese. After the first battle, they were always outnumbered, but they were fine fighters.

They had a very great leader. His name was Claire Chennault. Chennault was a schoolteacher. He became a pilot and fought in the last war. After the war he stayed in the Army. He was one of the best Army pilots.



General Chennault giving last-minute orders to a Flying Tiger. The Chinese sign on the airman's back says that he is an American fighting for China, and that he must be taken back to his base.

Captain Chennault worked out a new way of fighting in the air. He did not like the old way of having one plane fight against one other plane. This old way was called a dog-fight.

Captain Chennault wrote a book about his new way of fighting. He said, "We must fight in teams. We must always send up two planes as a team. It is even better to have one more plane high up in the air to keep watch."

Captain Chennault showed how the teams must fly together. He tied his airplane to two other planes with ropes thirty feet long. Then he had two pilots fly the other planes. While the three planes were tied together, they did banks and dives and loops.

Captain Chennault retired in 1937. This means that he gave up his work in the Army. He had become a little deaf from flying in open planes, so he settled down with his wife and their eight children. He thought he was through with Army life.

He did not rest very long. In that same year, 1937, he went to China because the Chinese wanted him to help them train fighting pilots.

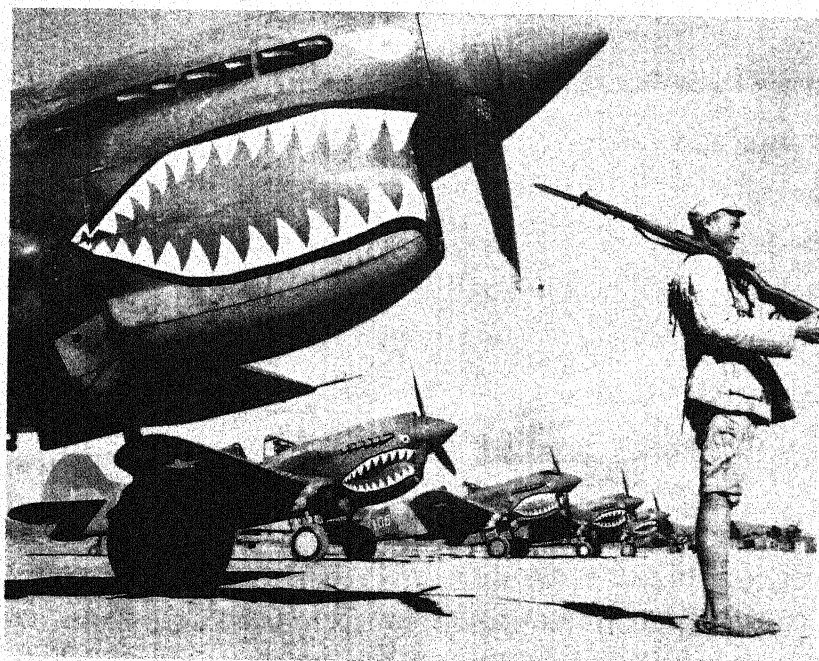
Captain Chennault begged America to send American planes to China. At last in December, 1940, America sent him one hundred pursuit planes. They were P-40 Tomahawks.

One hundred planes were not very many. Captain Chennault had to keep forty-five of them on the ground so that he could use them for spare parts when the flying fifty-five broke down.

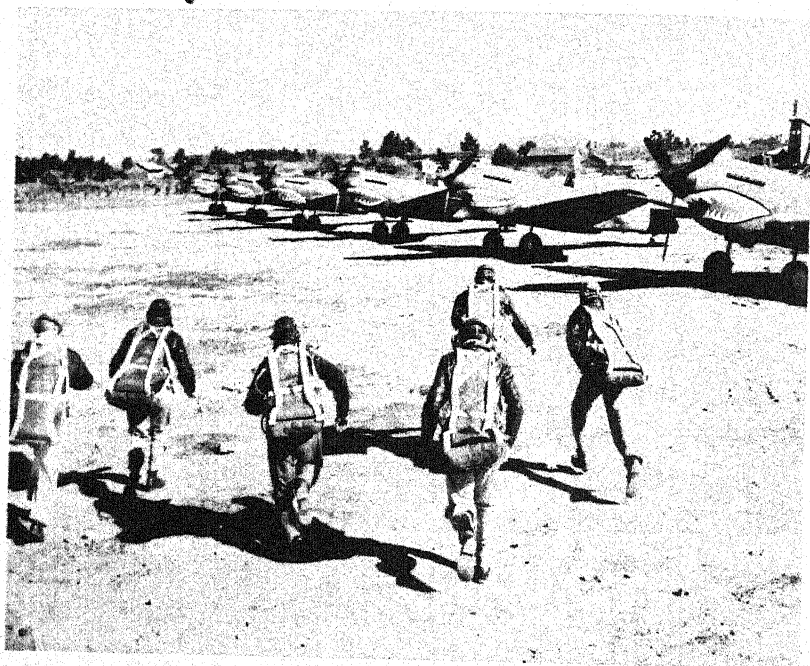
Then Captain Chennault asked brave American pilots and American mechanics to come to China.

American mechanics went to China to help fix the American P-40 planes. American pilots went too. The exact number is hard to know because some men came home again and some new men went to China later. There were about 132 men in the ground crew, and there were never more than 70 trained pilots. These were the Flying Tigers.

The Chinese made them an air base at a place called Kunming. They made hidden shelters for the Flying Tigers. The Chinese helped most of all by using little radios to tell of Japanese air raids. They always tried to tell the Flying Tigers ahead of time.



Line of Flying Tigers ready for a quick take-off. The Chinese guard stands watch all day and all night, on a twenty-four hour shift.



These Flying Tigers have just heard by radio that Japanese bombers are on their way.

Madame Chiang Kai-shek was the honorary commander of the Flying Tigers. She called them "My angels with or without wings."

When the Americans heard that the Japanese were afraid of sharks, they painted the front of their planes to look like sharks. They were going to call their planes "Tiger Sharks," but soon everyone called them "The Flying Tigers."

Captain Chennault taught his men to fight in teams. He told them never to fly alone. He told them never to waste bullets and he told them not to try to get every

one of the enemy planes. He said, "Hit hard and then go back to base."

On February 9, 1942, a fleet of forty-two Japanese bombers were getting ready to take off from their base. Three Flying Tigers flew by at 18,000 feet. Two of them dived and shot at the bombers with their machine guns and some bombs. They wrecked sixteen planes. Three Japanese pursuit ships came up to fight. The Flying Tiger who was high in the air shot down two of the Japanese planes. The third flew away. On that same day, six other Flying Tigers wrecked thirteen bombers at another air base.

In the time between December 18, 1941, and July 4, 1942, the Flying Tigers had wrecked 286 Japanese airplanes. They think that they blasted about 300 more which fell into the sea or the deep woods. If the wrecks were lost, they were not counted.

The Flying Tigers shot down at least 1,500 Japanese airmen, but the Flying Tigers lost only fifteen men in battle. Four others were missing but they may have been captured.

They fought against great odds. There were twenty Japanese planes to each one of the American planes. The Flying Tigers had only enough bullets to fire for about five minutes each time they went up in the air. They had no extra bullets or men. But they shot down thirty Japanese planes for each one of the American pilots killed.

Today the Flying Tigers are a part of the U. S. Army and Captain Chennault has been made a brigadier general. These pilots are now flying with the U. S. Army. They do not fight in their group any more but the story of the Flying Tigers is one of courage and brave deeds and clear thinking. And today in the East some American planes are still painted like those of the Flying Tigers.

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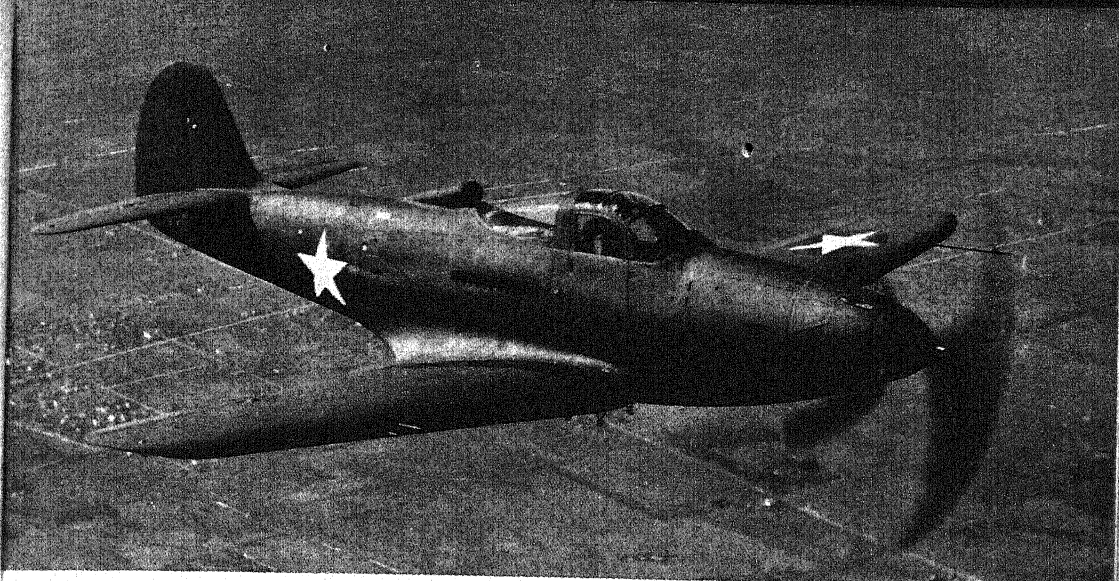
When Madame Chiang Kai-shek spoke in New York City on March 2, 1943, seventeen Flying Tigers walked beside her to the platform. They were her guard of honor. They had sent her a big basket of red roses, iris, gardenias and white orchids. There was a card with the basket, and the card said: "To our beloved honorary commander. From your 'angels with or without wings.'"

Brigadier General Claire L. Chennault
and the Flying Tigers."

THE BELL AIRACOBRA · P-39

The Airacobra is one of the oldest models of the Army fighter planes. It has been used ever since 1939 and it is still being made in the Bell factories.

The Airacobra has only one seat. It is a monoplane. This means that it has only one wing on each side of the body. It is called a "low-wing monoplane," because



Bell Airacobra, P-39

the wings stick out from under the body instead of from the middle or the top.

The wings of the Airacobra have a dihedral angle so they slant up a little toward the tips. This makes the plane steady.

The Airacobra is a very fast plane. It has an Allison liquid-cooled engine with nearly 1,200 horsepower. The Army will not tell us just how fast the P-39 can go, but we know it can fly about 390 miles an hour. It has dived at 625 miles an hour. The Airacobra can fight at 30,000 feet, but does better when it is not so high.

There are some very important new things about the Airacobra. One is the tricycle landing gear. Tricycle means three wheels. There are three landing wheels, two in the middle of the plane and one wheel way out in front under the nose. You cannot see these

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wheels when the plane is flying because they fold up into the body of the plane. The Lockheed Lightning, P-38, has tricycle landing gear too.

Another very important new thing about the Airacobra is the place of its engine. This engine is behind the pilot's seat. The engine runs the propeller with a drive shaft eight feet long. The Airacobra is the only airplane with its engine behind the pilot.

You know about the difference between an air-cooled engine and a liquid-cooled engine. A liquid-cooled engine is long and thin because the cylinders are put in straight lines. With a liquid-cooled engine, the airplane can have a very good streamline.

The P-39 has a better streamline than most airplanes. The engine is behind the pilot's seat and the nose of the plane is very smooth and pointed. The pilot can see out in front much better than in any other plane with one engine.

Another very important new thing about the Airacobra is that there is a 37 millimeter cannon right in the middle of the nose of the plane. The cannon barrel reaches back to the pilot's seat. The pilot can take very good aim because he can see so well over the smooth, pointed nose of the plane. No other airplane with one engine carries such a big cannon. One shot from this cannon could blast any bomber out of the sky.

The P-39 is a very deadly fighting plane. It carries a cannon and two machine guns in the nose. It also has

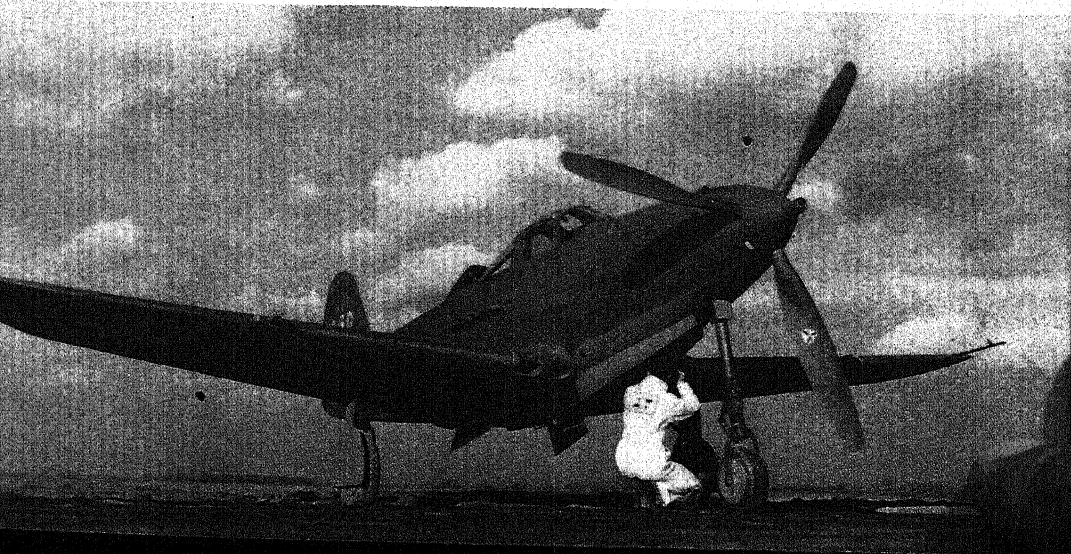
two guns mounted in each wing. This airplane is very safe for the pilot. The cockpit has heavy armor in all of the dangerous places. The glass is bulletproof and the gasoline tanks are self-sealing, so that if a bullet goes through the tank, the hole is sealed up before much gasoline can leak out.

Of course, the P-39 is not perfect. The Airacobra cannot climb so fast as some fighters. It cannot fly high enough to fight the German Messerschmitt and Heinkel. The British Spitfire fights around 30,000 feet but the Airacobra fights best at 15,000 feet.

The Bell Airacobra has fought in a great many battles. Even if it cannot climb fast enough or high enough to fight in England, it has done very well in other countries. It has been used in Russia and Africa and in the Aleutian Islands.

The Airacobra is a very good fighter close to the ground. The pilot can see the ground clearly and he can work with the troops on the ground. The cannon

Note the landing gear on this Bell Airacobra



and the machine guns are very good for blasting enemy troops, supply trucks, trains, and even tanks. Of course, no airplane is fit to do every kind of fighting. Pilots like the Airacobra for low fighting. They like its good armor and its heavy firing power. Some day we hope to have a fighter plane that is not too large. We want one that carries enough guns and also climbs fast and fights high in the air.

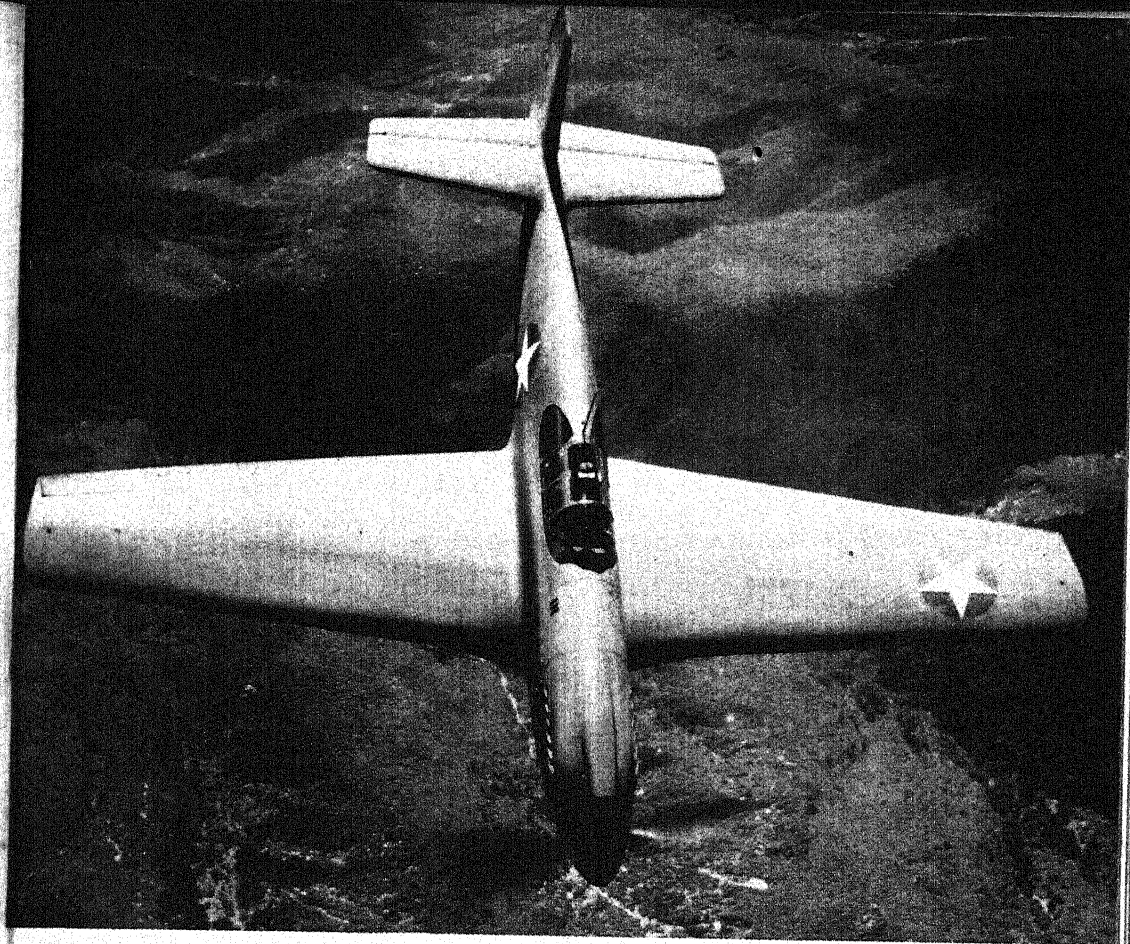
THE NORTH AMERICAN MUSTANG · P-51 AND A-36

The North American Mustang, P-51, has just been given a more powerful engine than it used to have. Now it can fly very high and it is one of the best all-around fighters in the Army.

It is even used as a fighter-bomber. The A-36 is the Mustang with new diving brakes so that it can be used for attack bombing.

You can tell the Mustang from other planes because its wings have almost square tips. The tail fins have square tips like the wings. The body of a plane is called the fuselage. The fuselage of the Mustang is long and thin and it is well streamlined. The nose is smooth and pointed.

At first glance the Mustang looks a little like the P-40. It also looks something like the Spitfire and the Messerschmitt 109. Airplane makers say that the



North American Mustang, P-51. Its wingtips, tail plane and rudder are almost square.

North American engineers who planned the body of the Mustang drew the plans by using arithmetic to find the right lines to go with the Mustang's engine.

Of course, all engineers do this when they draw a fuselage, but many of them think more about the way the airplane will look. The men who drew the plans for the Mustang thought more about how it would work. The wings of the Mustang have a dihedral slant

to make the plane steady. The landing gear looks like the landing gear of most planes.

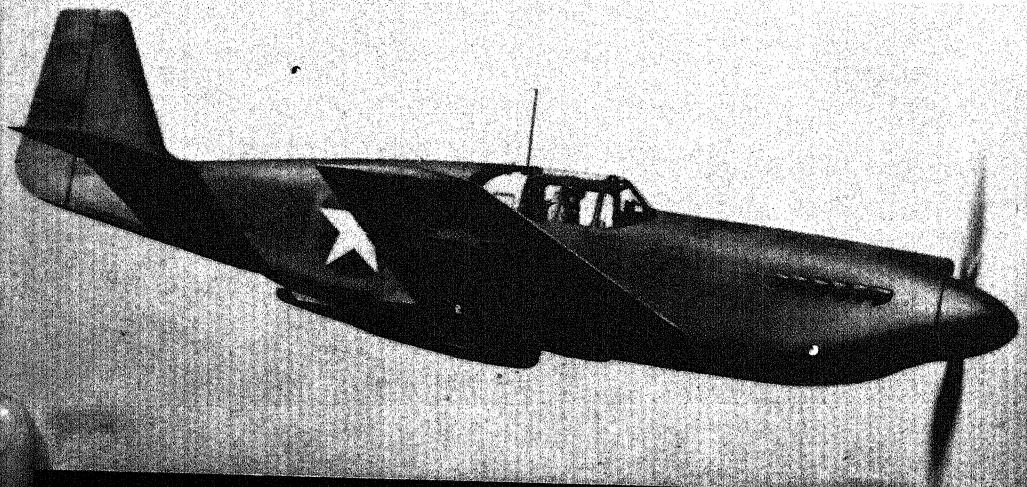
The British RAF pilots say that this landing gear is very strong and sturdy. They like it because the plane can land on rough landing fields or steel mesh landing strips. Steel mesh landing strips are put down when an army has not had time to make a real landing field.

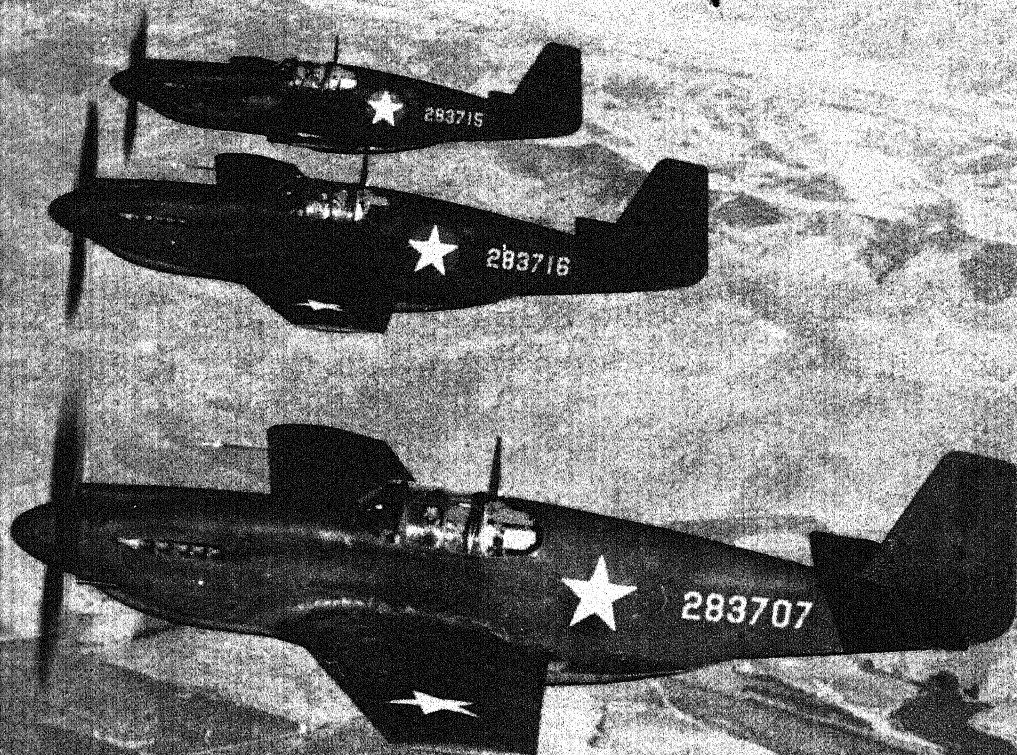
The engine of the Mustang is liquid-cooled. We do not know how fast the Mustang can go but we do know that it can fly about 400 miles an hour. It is one of the fastest planes in the Army and it fights at around 35,000 feet up in the air.

The Mustang has good armor to make the pilot safe, and it has at least six machine guns—three in each wing. The Army does not want to tell just how many guns there are, but we know that more guns have been added since the first Mustangs were made.

The Mustang has been very useful in the war. It is a high-altitude fighter. It also works well with the

North American Mustang in flight





Three North American Mustangs, A-36, used for bombing

ground troops. It is so fast that the anti-aircraft guns find it very hard to hit. Pilots who fly the Mustang say that it is very easy to steer. Even with its great speed it is easy to turn or swoop or bank or dive. That is another reason why the Mustang is one of our best fighting planes.

THE LIFE OF A PLANE IN THE UNITED STATES AIR FORCE

We have read about some models of fighting planes. Do you know that each model in the U. S. air force has four stages in its life?

The first stage is the time when a new model is tried out. When the Army needs a new kind of plane, it buys a new model to try. The Army pilots test the plane and see what they think of it. In this first stage the airplane is called an experimental model. The experimental model has the letter X painted on its rudder beside the other letters. Its letters might look like this: XP-1.

The next stage in the life of the airplane comes when the air force buys more models. Air force squadrons fly these planes and try them out and tell the air force how they like the planes. These airplanes are called service test models. Their letters are changed. The X is dropped and there is a Y instead: YP-1.

If the squadrons like the model, the Army buys lots of these airplanes. Then they are called standard models. The Y is dropped from the letters: P-1.

The fourth stage in the life of the air force model is the last stage. After it has been used until the Army decides that it is no longer good enough to buy, or a better model has been discovered, the letter Z is put in front of its letters and the plane is called an obsolete plane. This does not mean that the plane is not safe.

It means that the air force is not going to buy any more planes of that model.

If you count from the time when the model becomes a standard model, attack planes and bombers have about six years of service life.

Planes used for scouting the countryside are called observation planes. They have a service life of about eight years.

All other models live about ten years in the air force.

The letters painted on the rudder of the plane tell us a great deal. The Army and the Navy do not have the same letters. These are Army letters.

The first letter tells what kind of work the plane is going to do. A means attack. P means pursuit, and it is used for fighter planes. B means bomber. There are many other kinds.

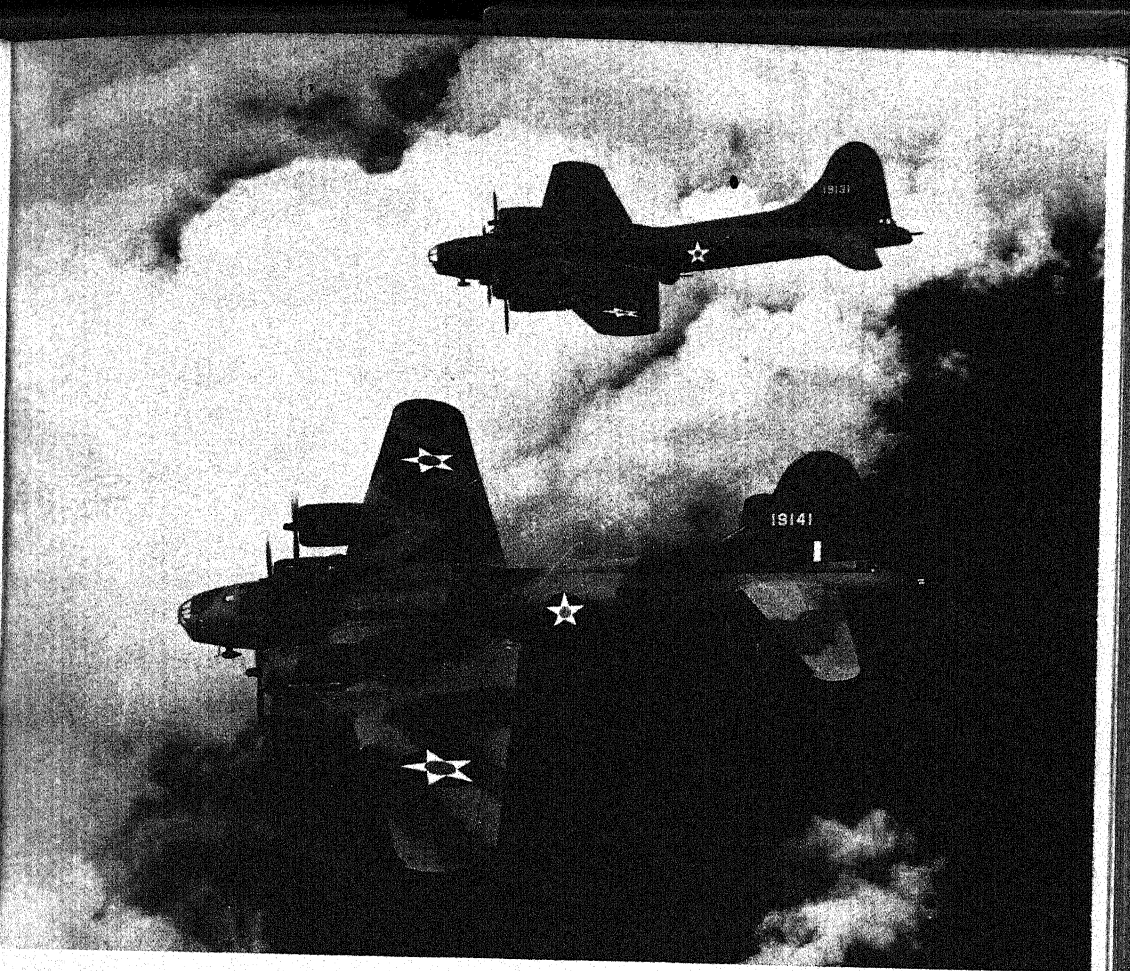
After the letter comes a number. This tells the model of the plane. If we see P-1, we know that the airplane is a pursuit plane, model number one. But if we see P-1A, we know that it is a pursuit plane of model number one with something new done to it. Every time some small change is made in a model, a different letter is added at the end. You remember that the P-40 had so many changes that there were models going all the way from P-40 to P-40F.

The P-40E is the Kittyhawk and the P-40F is the Warhawk. Even with their changes they are not so very different. They still belong to the P-40 family. We call

this family a series. Today the series letters are changing so fast that we shall leave them out of this book.

When a very big change is made, the model takes another number. This means it belongs to another series. The P-43 and the P-47 are both made by the same company, but they are very different models. The P-38 and the P-39 are made by different companies. These are all pursuit planes.

Now let us see what the letters on the rudder of an Army plane mean. XP-1 means experimental model, pursuit plane, model 1. YP-1 means service test model. P-1 means standard model. P-1A means standard P-1 with some changes. P-1B means P-1A with some changes. P-2 means standard model pursuit plane. It may be P-1 with such a big change that it is really a new model, or it may be a different model. ZP-1 means that P-1 planes are now obsolete. No more of them will be added to the Army planes.



Flying Fortresses above the clouds

Chapter 2 · THE BOMBERS

We have read about the most important airplanes in the fighter class. We found that the P-38 and the P-47 could fly very high in the air. The word for “in the air” is altitude. We often hear people say that a plane can fly at a high altitude or a low altitude. Sometimes they speak of medium altitude. That means just in between: somewhere around 18,000 feet.

The P-38 and the P-47 belong to the high-altitude

class of fighters. They are interceptors.

The P-40 and the P-39 belong to the medium-altitude class.

The P-51 used to belong to the low-altitude class. It used to fly fast but not very high. Now the Army has given it a new engine and has made it a high-altitude fighter.

These planes are very important but the bombers are even more important. Bombers are like the big guns of the Army. They carry the bullets farther than the guns on the ground can shoot. They hit the targets better than big guns can from far away.

We have three kinds of bombers, heavy bombers, medium bombers, and light bombers. Heavy bombers carry big loads of bombs on very long trips. They must be big enough to carry a great deal of gasoline. These bombers also must be able to fly high. Often they go too far away for their fighter planes to go with them. Then the bombers must be ready to fight if enemy fighters attack them. They have good armor and very powerful guns besides their bombs. Our heavy bombers are the Flying Fortress and the Liberator.

THE BOEING FLYING FORTRESS · B-17

Every day you hear about the good work of our heavy bombers in the war. We are very proud of the



Boeing Flying Fortress, B-17

Boeing B-17 Flying Fortress and the Consolidated B-24 Liberator.

The Flying Fortress has gone through a great many changes. It first came to the Army in 1937 as the B-15. Then it was changed to the B-17. Since then it has been made in seven models.

Perhaps when you read this there will be another model, a new heavy bomber even better than the B-17.

The Flying Fortress is a large, low-wing monoplane. You can tell it easily by its size and by its tail fin. The tail fin is very high and slopes down to the fuselage.

This airplane has four air-cooled engines. Each engine has about 1,200 horsepower. The Flying Fortress can go well over 300 miles an hour. It can fly more than 2,000 miles without coming down for more gasoline.

The Flying Fortress is a very powerful fighter. Besides its heavy load of bombs, it carries machine guns

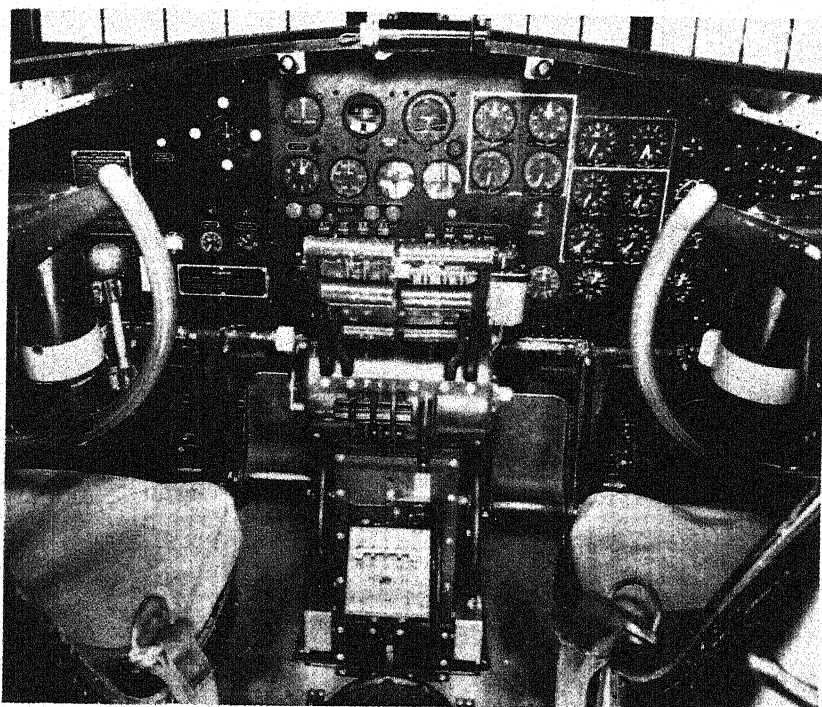
and maybe a light cannon. In the early models, the guns were put in little rooms that bulged out of the sides of the fuselage. These little rooms were called "blister" turrets. The blister turrets slowed down the speed of the airplane. In the later B-17 models the blister turrets are gone. The fuselage has a much better streamline.

When the Flying Fortress has to fight, power turrets are used. Power turrets are domes which are moved by machinery. In some airplanes they come out of the fuselage when they are needed and they go back into the fuselage when the fight is over. On the Flying Fortress the power turrets stay outside of the fuselage. They are made of bulletproof plastic. Each turret usually has four .50 caliber machine guns. These guns are turned by electricity. The Flying Fortress has one power turret on top and one power turret on the bottom. Of course it has guns in front. It also has guns in the tail. These are called stinger guns, because the stinger of a wasp or a bee is in its tail.

Someone has said that in 1942 nearly one hundred Japanese planes were shot down before the Japanese found out that the Flying Fortress had a stinger in its tail. That shows us why the Army wants to keep new things secret.

The Flying Fortress is so large that it needs a crew of nine men. There is a first pilot and a second pilot. They sit side by side. Each has his own set of controls.

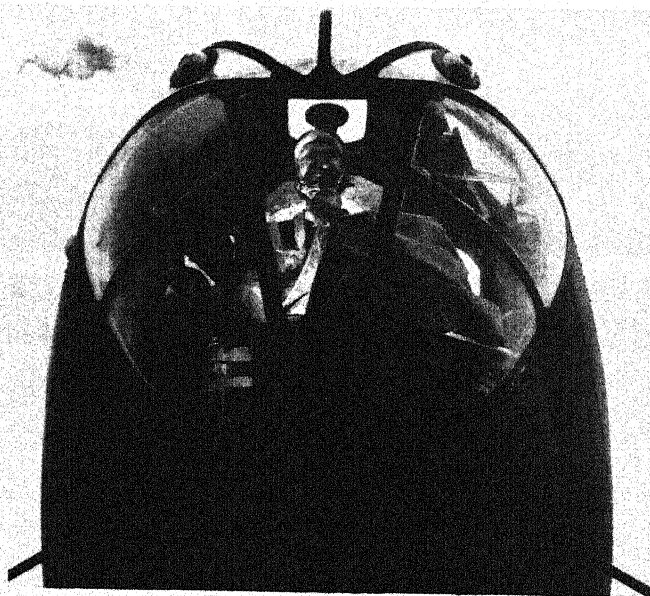
There is a navigator. The navigator studies the maps and tells the pilots where they are and where to go. There is an engineer who takes care of the engines even when the plane is in the air.



Instrument panel in a Flying Fortress

There is also the man who drops the bombs. He is called the bombardier. He has to be trained to use a bomb-sight. The bomb-sight is a very wonderful thing. When a bomb is dropped from a plane flying high up in the air, it does not fall straight down. It goes forward a little the way the plane is going. The bomb must be dropped before the plane is over the target.

The bomb-sight tells the bombardier when to drop a bomb so that it will hit a target in front of the plane. The bomb-sight even tells him how to allow for the drift of the wind and the speed of the plane. We have one of the best bomb-sights in the world. The Army is



Bombardier in the nose of a Flying Fortress. In case of an attack, he also fires the machine gun in the nose of the plane.

very careful of it. Armed men take care of it when it is on the ground.

The bombardier also mans the nose guns and there is a gunner in the tail and one in the lower turret. Other men in the crew are the two radio men. They fire the waist guns. They also keep in touch with the other airplanes and with the ground.

The most important thing about the Flying Fortress is how high it can fly. It flies so high that it is out of the range of enemy guns and of many enemy fighters. It can fly seven miles above the ground. The first time it was used against the Germans was in 1941. Several Flying Fortresses dropped bombs on German boats in the harbor of Brest. The bombers were so high up in the air that the people on the ground could not see them or hear them. If you look in the newspaper you will see stories about Flying Fortresses almost every day.

A STORY ABOUT A FLYING FORTRESS

This is a true story. One day in October, 1942, many Flying Fortresses had dropped bombs on a German war plant in France. When one Flying Fortress turned to go home, some German planes came up to fight. A cannon shell struck a power turret of the Flying Fortress. It knocked out one of the machine guns. It hit Staff Sergeant De John in the left side, but he kept on firing his good gun with his good hand. He set a German Focke-Wulf 190 on fire and knocked it out.

For ten minutes Sergeant De John stuck to his gun. Then the navigator, Second Lieutenant Spellman, pulled Sergeant De John into the radio room. Then Lieutenant Spellman went into the gun turret. He had

no hat or gloves or coat. It was twenty degrees below zero in the gun turret.

There were a lot of Focke-Wulfs. Lieutenant Riordan said they swarmed around the B-17 like bees. Two cannon shells banged into the motor controls.

Then Lieutenant Riordan said, "Men, you had better get ready to bail out."

But the men were too busy to think about jumping out.

A cannon shell made a hole in the fuselage as big as a cabbage. It was right beside Sergeant Santoro. He was the engineer and a gunner, too. His ammunition belt was cut in two by a machine-gun bullet. He put on a new belt and shot down a German fighter.

Staff Sergeant Owens was the gunner in the low turret. He sent another enemy plane spinning down and crippled several others.

After nearly an hour of fighting, four German fighters had been shot down.

Four more were hit. The Germans gave up the fight. The Flying Fortress made her way home. There were holes all over her, and sixteen square feet of metal were ripped off one wing.

At home everyone was proud of the brave fliers. Even King George praised them and he said, "I do not see how you did it."

Everyone was glad, too, that a Flying Fortress could fight so well without the help of fighting planes.

WHY THE FLYING FORTRESS CAN FLY SO HIGH

Did you ever ask why the Flying Fortress and the Liberator, the Lockheed Lightning and the Thunderbolt can fly above 35,000 feet? Most airplanes cannot fly so high. The British bombers used to do all their work at night because they could not fly higher than most of the enemy fighter planes. Now the British and Americans are making daylight raids because the Flying Fortress can go above most interceptors. How these airplanes can fly so high is an interesting story.

You know that when an engine goes, it burns gasoline and air. The air is just as important as the gasoline. When the engine is going at its very best, it burns twelve pounds of air every time it burns one pound of gasoline. Our automobile engines run on the ground and they burn that much air and gasoline in their cylinders.

As you go above the earth, the air gets thinner and thinner. When an engine goes high above the earth, it has a hard time taking in enough air because the air gets lighter. The gasoline will not burn well without enough air. At first, airplane engines could not go above 6,000 feet up in the air.

In the last war, engineers were asking, "How can we give the engine more air at a high altitude?"

Many engineers tried to find the answer to this question. In 1917 and 1918 engineers in England and

America thought of a way to pull more air into the carburetor. They made a powerful, high-speed fan. This fan pulls lots of air into the engine. It crowds the air into a small space, so the air is just as dense as it is at the level of the sea.

This fan, with all its parts, has a name. It is called a supercharger. It is run by gears from the crank shaft, but goes around seven times faster than the crank shaft. That means that it turns around 17,000 times in one minute.

This supercharger is not perfect. One trouble is that there is no way to stop it. It has to run even when the plane is flying very low. If too much air comes into the engine, it makes the engine get too hot. Then the valves and piston rods will burn up. The only way to slow down the supercharger is to slow down the whole engine. This means that the pilot uses the engine at full speed to get off the ground, and after that he must slow down the engine until he gets higher up. As he climbs he must run the engine faster to let the supercharger use more air. At last he reaches a place where the air is so thin that he cannot go at full speed even with a supercharger. He must slow down very much if he goes higher. This is called the critical altitude.

The critical altitude is not the same with every plane. Most planes with this kind of supercharger have a critical altitude of between 7,000 feet and 9,000 feet.

But 9,000 feet was not high enough for the Army

pilots. They wanted to fly still higher. Then our engineers made a supercharger with two speeds. This supercharger works just like the one-speed supercharger but it can go faster. It has a clutch and a change of gears. A pilot flies up to 7,000 feet with the supercharger in low gear. Then he changes it to high gear. The supercharger turns ten times as fast as the crank shaft. It pulls much more air into the engine. The critical altitude for most airplanes with a two-speed supercharger is around 17,000 feet.

Today nearly every airplane has a supercharger. Some planes have a one-speed supercharger. The Airacobra has a two-speed supercharger. Every plane that flies above 6,000 feet has some kind of supercharger.

Even the two-speed supercharger is not good enough. In this war engineers have been asking again, "How can we give the engine more air at a still higher altitude?"

Today the man who has found the answer to this question is Dr. Sanford Moss, who works with the General Electric Company. He has thought of a new kind of supercharger. He has been working on this supercharger for twenty-three years.

In 1918, Dr. Moss and some Army men took an engine to the top of a mountain. The mountain was 14,000 feet high. On the ground the engine gave 350 horsepower. On top of the mountain it gave only 230

horsepower. Then Dr. Moss put on his new supercharger and the engine gave 356 horsepower.

Then Dr. Moss tried the supercharger in a real airplane. The supercharger was tested at 20,000 feet and at 25,000 feet and 30,000 feet. Something went wrong on every flying test. Once a rod broke because it got too hot. Something always seemed to happen.

On February 27, 1920, Major Shroeder was testing the supercharger for Dr. Moss. He flew all alone. He climbed to 38,000 feet. He did not know that the oxygen in his tank was all used up. Without extra oxygen, he could not breathe. Major Shroeder fainted and his plane fell five miles. He came to his senses just as he was about to crash, and he landed safely. It had been very cold so high in the sky. It had been sixty-seven degrees below zero and Major Shroeder found that his eyes had nearly frozen. He spent some time in the hospital after that test, but he felt very happy because he knew that the supercharger had really worked well.

This supercharger is called a turbo-supercharger. It is a fan that goes on the exhaust pipe of the engine. The exhaust gas comes out of the engine with great force. It drives the fan very fast. The fan turns a rod. The rod turns another fan that pulls in a tremendous amount of air. Then this air is pressed into a small space and pushed into the old crank-shaft supercharger in the engine.

There are some very good things about the turbo-supercharger. It fits right on the outside of the airplane at the exhaust pipe. The airplane does not have to be made over to have the turbo-supercharger.

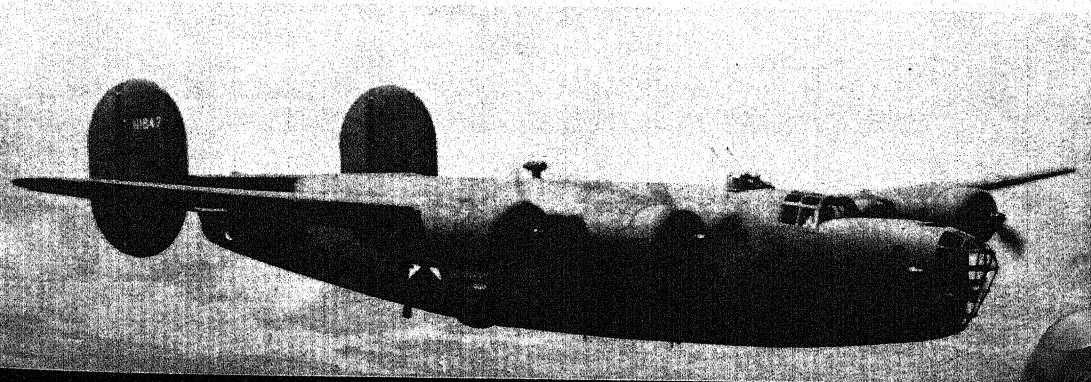
Another good thing is that the turbo-supercharger can be turned off when the engine is flying low. The engine can go at full speed without using the supercharger.

The best thing about it is that it pulls in so much air that it makes an engine able to go at full speed at all different altitudes. We do not know just how high a plane can fly with a turbo-supercharged engine, but every day our planes are flying at 35,000 feet.

We all know that it is very exciting to fly an airplane, but do you know that it can be even more exciting to work on an idea? If you are really interested, even twenty-three years may seem like a short time.

In the United States we give a prize each year to the man who has done the most for flying. In 1940 the Collier Trophy was given to Dr. Moss for inventing the turbo-supercharger.

Consolidated Liberator, B-24



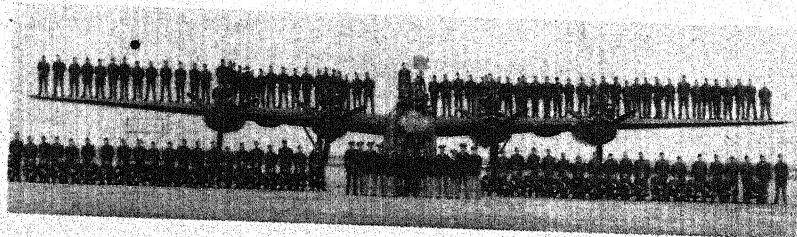
THE CONSOLIDATED LIBERATOR · B-24

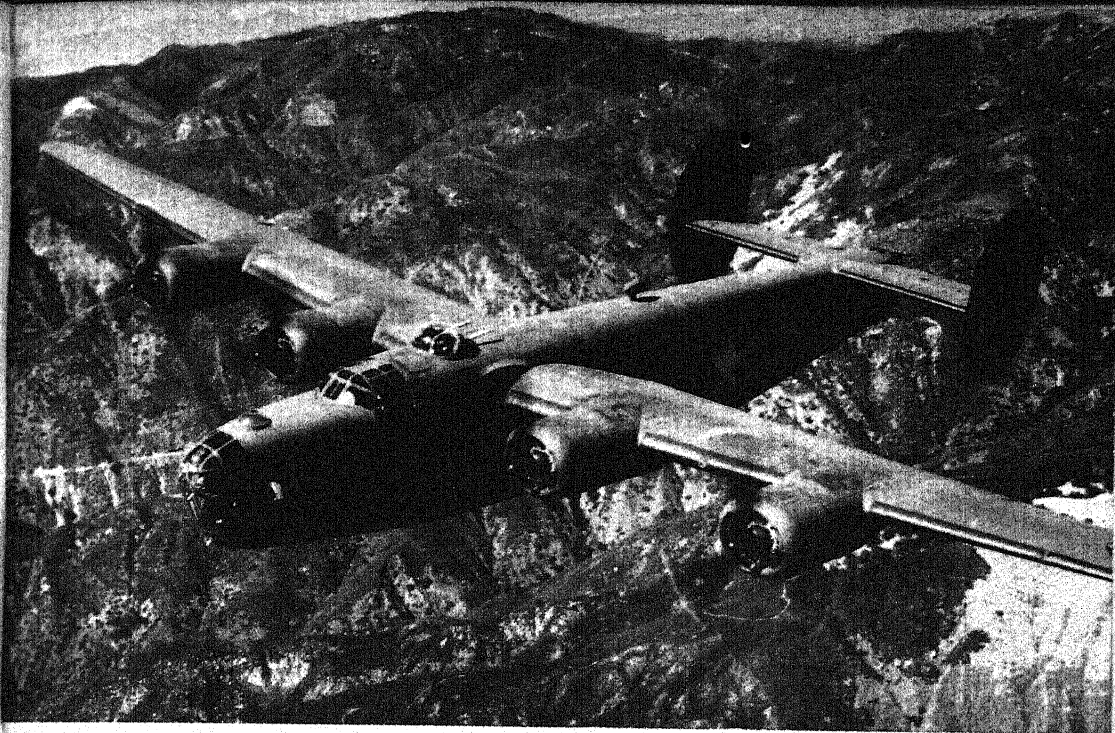
We have read a great deal about the Flying Fortress but the United States air force has another fine heavy bomber. This is the Consolidated B-24, the Liberator. It is one of the best airplanes in the world. It has a range of nearly 4,000 miles. This means that it can fly nearly 4,000 miles without coming down for more gasoline. The Liberator has such a long range that we use it to carry men and food and guns across the Atlantic Ocean. Some Liberators are even being made as transport planes. Their Army number is C-87 and we shall read about them later.

The Liberator is able to carry a very heavy load. It carries more than four tons of bombs. Even with this load it can fly at 34,000 feet, above all bad weather and above most enemy fighter planes.

The Liberator is a very fast airplane. It has four engines with turbo-superchargers. It can fly about 300 miles an hour with a full load. It holds the speed record for crossing the Atlantic Ocean and for crossing

The Consolidated Liberator is a big plane. Count the men standing on one wing.





Consolidated Liberator, B-24

the Pacific Ocean. It flew from Newfoundland to Britain in six hours and forty minutes, and it flew from Brisbane, Australia, to San Francisco in thirty-five hours and fifty-three minutes.

You could easily spot a Liberator if you saw one. It is a large, high-wing monoplane with four engines. It has twin tail fins and rudders, and these are oval-shaped. The landing gear is made of three wheels—tricycle.

Although it is a bomber, the Liberator is a good fighter. It has armor for protecting the crew and gun turrets on top and in the tail and in front.

Every day we hear stories of Liberators in battle. Here is a true story of one Liberator.

One day a Liberator far out over the sea saw a German submarine. The airplane flew over the submarine and dropped a bomb right on the tower. The blast was so great and came so quickly that the airplane was caught by it.

The pilot told about it later. He said, "The big bomber was carried right up three hundred feet into the air. I thought, Here we go into the sea! I called to the copilot to push on his stick. We both pushed, but we found that something was broken. We could not keep the plane from climbing. We started on our long trip back to our base."

Both pilots pushed and pushed to keep the plane from climbing higher. The radio man kept sending SOS calls. The navigator was trying to find the place on his maps. The flight engineer was lying in oil trying to fix a broken pipe. The gunner in the rear was smashing his way out of the gun turret, which had stuck.

The tail gunner said later, "I started to throw over everything that would move. I threw out bullet belts, guns, everything. I even tried to throw over the rear gun turret, but it would not go. The inside of the plane was a mess. There were holes all over the fuselage. Oil was pouring out of the broken line."

The flight engineer wanted to drop the two last bombs. He found the switch was broken and that he would have to pull the bombs loose by hand. To do this he had to stand on a catwalk only one foot wide.

A catwalk is a narrow strip between the bomb racks. When the bomb bay is open, the catwalk is like a narrow bridge over open space, and the open space is all outdoors. The flight engineer took his shoes off because they were so wet with oil that he might have slipped. Below him—10,000 feet below—lay the sea. He worked an hour and a half to throw off the two bombs by hand.

And all this time the four good engines kept right on going smoothly. The crew all crept into the nose, trying to keep the plane from climbing higher. At last, when it was 14,000 feet up, the navigator said land was below.

Then the men had to decide whether or not they wanted to bail out. All of them made up their minds to stay with the airplane. The pilot turned off the engines and the plane's nose began to drop. The plane was out of control. It came down with a huge crash. It slipped along the ground and it broke everything around it. The pilot said later, "Then it was very quiet and pitch dark. A flame shot up. We all bounced out in quick time. We had good luck. When the cockpit went up in flames a few minutes later, we were all safe."

This shows how brave our flying men are. But it also shows that the Liberator is a very strong airplane. After it had been badly hurt, it was able to fly back to its base more than 800 miles away.



Douglas B-19, followed by a P-40. The fighter looks very small beside the huge bomber.

THE DOUGLAS · B-19

The Douglas B-19 is probably the largest land airplane in the world. It weighs eighty-two tons and that is twice as much as any other land plane weighs. It is so big that its wings are two stories high and its tail fin stands as high as a three-story house. If we could take the wings off and stand them on one tip, they would reach higher than a five-story house.

The Douglas B-19 is a low-wing monoplane with four engines and a tricycle landing gear. It has gun turrets in the nose and tail and on the top and bottom of the fuselage.

The B-19 has a very long range. It could fly from

New York to Europe and back again without stopping for more gasoline. It flies over 20,000 feet up in the air and it can go faster than 225 miles an hour.

This big plane can carry a very heavy load. It can take a bomb load of 56,000 pounds, or it can carry 125 soldiers with all their packs and guns.

The crew of the B-19 has a dining room and rooms and beds for sleeping.

The Douglas Company spent four years making this giant bomber. In this one airplane there are ten miles of electric wire, two miles of control cable and more than three million rivets.

The B-19 has flown many hours, but we have not yet used it in the war. It is really too slow for fighting and too hard to maneuver. It is so big and heavy that it can land on only the very biggest air fields.

Some day we expect the B-19 to be very useful. Perhaps after the war we may all take trips in it around the whole world.

WAYS OF BOMBING

We have read about our most important heavy bombers. Before we go on to the medium bombers, let us find out something about bombing. There are six main ways of bombing. Each way fits a certain kind of target.

If you were trying to hit a very small target, you would have to be very careful and exact. The word that means being exact is "precision." The Army calls exact bombing precision bombing. For precision we use a bomb-sight. In the chapter on the Flying Fortress, we read about the bomb-sight and found that it showed the bombardier when to drop the bomb. We know, also, that the turbo-supercharger is a great help in precision bombing. It allows the airplane to go high enough up to be out of range of most enemy fighters, so that the bombing can be done in daylight. The pilot must fly a straight, even course until the bomb-sight shows that the time has come to drop the bomb. That is precision bombing.

Now suppose you were going to bomb a large area. You would need a good map and pictures of the place. Then you would have to divide the map into parts and plan what kind of bombs must fall into each part. You would need many airplanes flying in squadrons. Each squadron would have one job to do. Each squadron would bomb one part. This is called pattern bombing. Pattern bombing is usually done at night because the squadrons make good targets for anti-aircraft guns in daylight.

If you wanted to bomb tanks or trucks or trains, you would use attack bombing. Here the pilot swoops down on the enemy in long, sweeping dives. He fires his machine guns on the way down. When he is very

low he drops bombs which burst into pieces. Often these bombs have little parachutes to keep them from hitting the ground before the airplane flies out of reach.

Attack bombing is not the same thing as dive bombing. Dive bombing was first used by the United States Navy. It is the best way to attack a small moving target. When a Navy pilot, flying at a high altitude, sees an enemy ship, he aims with the nose of his plane. Then he swoops down at a terrific speed and drops his bomb when he is close to the ship.

Often he has a hard time coming out of the dive, and some dive bombers have gone into the ocean. But the ship has a still harder time getting away from the bomber. Her anti-aircraft guns are of no use unless there are a great many of them. Dive bombing is not so good for the Army because if a lot of anti-aircraft guns fire into the path of the dive bomber, they are sure to hit the bomber when he flies into them.

The Germans are finding that dive bombers are easily shot down on land. So they are trying a new kind of dive. Here the pilot comes down in curves like a round staircase and does not fly straight until the very end. The Germans hope that the anti-aircraft guns will not be able to hit the plane in this kind of dive. Our Army finds attack bombing safer than dive bombing.

Another kind of bombing is used by our Navy. This is called torpedo bombing. Torpedo bombers fly at

high altitudes. When they see a ship below they dive down and fly in a line toward the ship. They dive until they are about 2,000 feet from the ship and less than 100 feet above the water. Then they level off and drop the torpedoes and fly up quickly.

The torpedoes must be dropped at just the right angle. If they are pointing down too much, the torpedoes dive into the sea. If they are pointing up too much, they bounce out of the water. They must fall in just the right way to travel straight through the water to the target. Torpedo bombing is so dangerous that it is often done at night or with a smoke screen.

Each kind of bombing needs its own kind of bomber. Precision bombing is done by heavy bombers and medium bombers. Pattern bombing may need every kind of bomber. Attack bombing is done by light bombers. In England, light bombers are called attack bombers because they do this kind of work. Instead of attack bombers our Navy has scout bombers and torpedo bombers and it uses them, of course, for dive bombing and torpedo bombing.

There is now a new kind of bombing which does not need a special kind of bomber. Any very fast airplane that can carry a bomb, can do skip bombing.

Skip bombing was discovered by accident. One day a burning Flying Fortress came low over the water and dropped its bombs. The crew only wanted to get rid of the bombs, but they were very much surprised to see

them skip along the top of the water and sink an enemy ship.

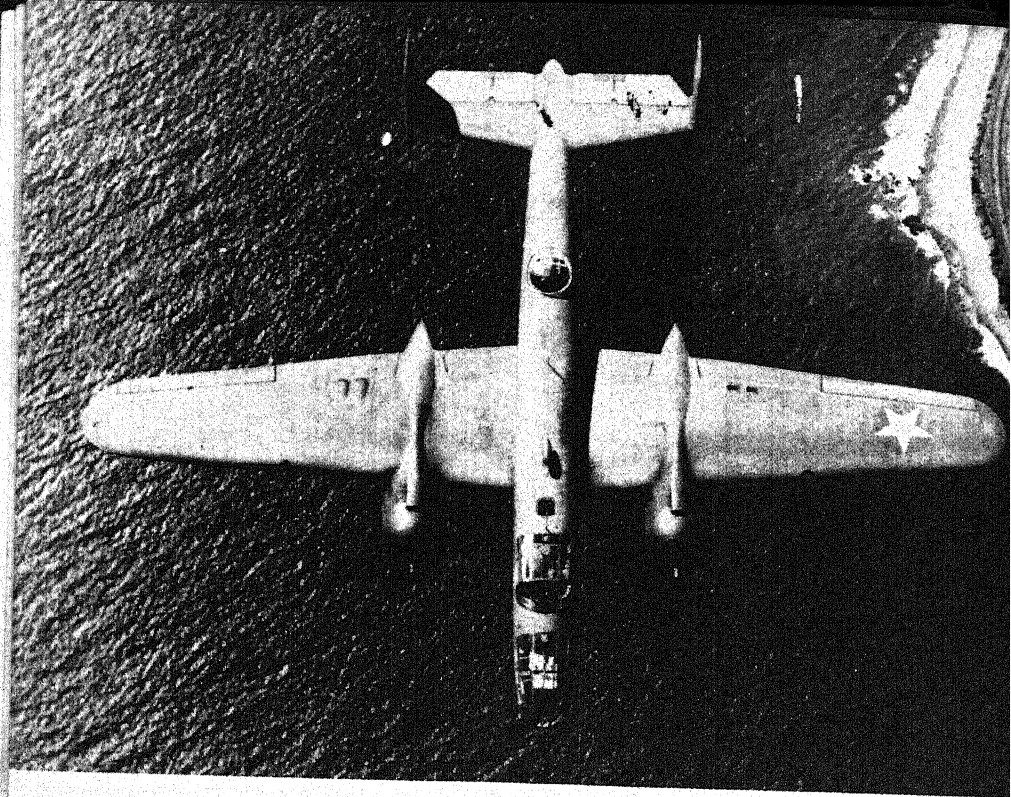
If you have ever thrown a flat stone across the top of the water, you have seen it skip. Bombs are so streamlined that they do the same thing if they are dropped from a plane flying very low and very fast.

Skip bombing is a most useful way of bombing because it can be done by any fast plane and because it uses bombs instead of torpedoes. Bombs are cheaper than torpedoes. They have no waste space. They are filled with explosives. Torpedoes have a great deal of machinery inside of them to make them go through the water. Only a part of a torpedo holds explosives.

MEDIUM BOMBERS

THE NORTH AMERICAN MITCHELL · B-25

It is an old Army rule that you do not use a big gun when a small one will do. On some trips, it would be wasteful to use a big Flying Fortress or a Liberator. We have medium bombers to carry heavy loads short distances. These bombers are used for daylight raids and night raids. In the daytime fighter planes go along to protect the bombers. At night the bombers carry more gasoline, and not so many bombs. Then they fly farther than the fighter planes can go.



North American Mitchell, B-25

The North American B-25 is one of our best medium bombers. It is named the Mitchell for a famous American flier, General Billy Mitchell. This bomber is a high-wing monoplane. Its wings have a little dihedral slant. The Mitchell has two engines with 1,350 horsepower in each one. We do not know the exact speed of the Mitchell, but we are told that it is faster than many fighter planes. It can fly well over 275 miles an hour and it has a range of more than 2,600 miles.

The tricycle landing gear of the Mitchell is very fine. It can be raised and lowered so quickly that the

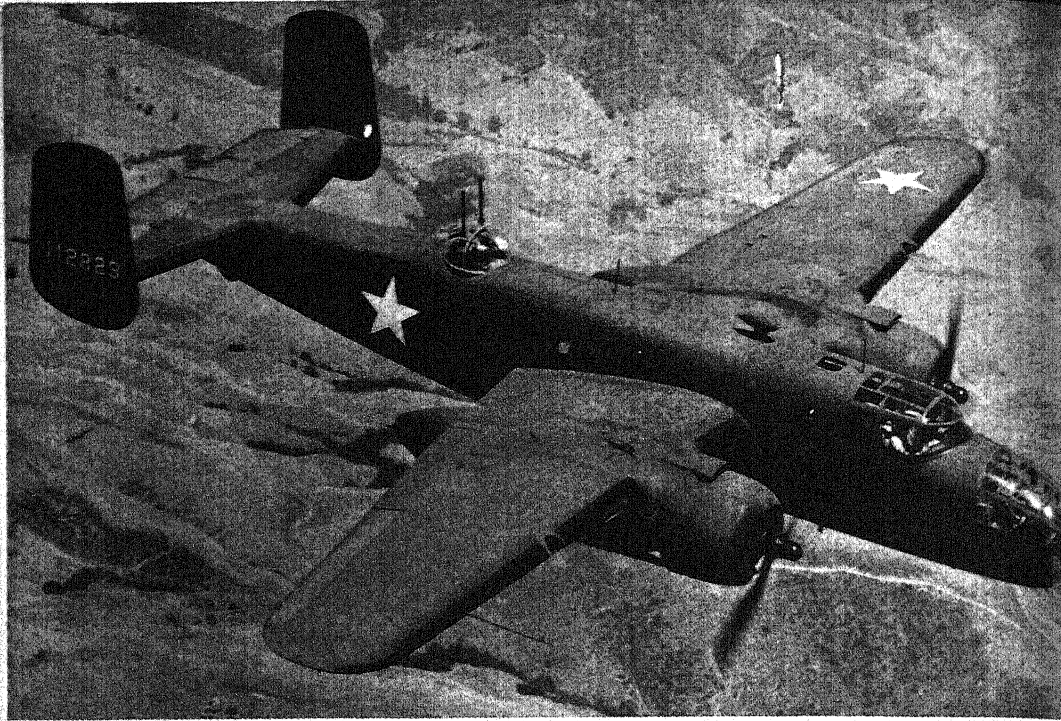
Mitchell can use landing fields marked out for smaller airplanes.

It is a good fighter. It has armor for protection and power-driven gun turrets. It carries over two tons of bombs when it is flying at almost full speed.

This airplane, which carries a crew of five men, has been the first bomber to do several things. It was the first U. S. plane to sink a submarine off our Atlantic coast. In February, 1942, a B-25 sank a giant German submarine. It was the first airplane to bomb the Japanese on land which the Japanese had captured. Under General Royce, it made raids on the Philippine Islands. It was the first airplane to strike a blow at the Japanese at home. This is the B-25's most famous raid—Major General Doolittle's raid on Tokyo.

On April 18, 1942, General Doolittle and seventy-nine other American fliers flew over Japan. The bomber crews did not know where they were going until they were nearly ready to take off. They had asked to go on the trip because General Doolittle had said it would be dangerous, important and interesting. For three months ahead of time they practiced and worked on the plan of attack in Florida. Then they were put aboard the carrier *Hornet*.

They had planned to sail to a point four hundred miles away from Tokyo. As they came nearer and nearer, everyone grew very tense. On April 18 at 4:15 in the morning, all the fliers were called to their planes.



Mitchell on a test flight

An American cruiser protecting the *Hornet* had just sunk two Japanese ships.

Everyone thought these ships might have sent a radio message home telling about the *Hornet*. General Doolittle decided to attack Japan right away, even though the *Hornet* was a long way off. He had planned to sail to a spot four hundred miles away, but on April 18 it was eight hundred miles to Tokyo, and it was still farther to the coast of China. This meant that the fliers would not have much chance of reaching China safely after the raid. But they set out bravely.

At 8:20 in the morning General Doolittle flew his B-25 off the *Hornet*. Everyone cheered. Within an

hour all sixteen bombers were in the air. They flew toward Japan. They went very low because they did not want to be seen. Most of them were only one hundred feet above the water all the way.

Each plane had its own job to do. At noon they were over Japan. They separated and set out for their own bombing targets. They bombed the five main cities of Japan, and docks and airplane factories. They did not bomb houses or the Emperor's Palace, but only war plants. The fliers flew low so the anti-aircraft guns could not aim at them. They were so close to the rooftops that they could see the people looking up in surprise.

After the targets were bombed each airplane tried to reach China. It was a long trip and gasoline was running low. Night came, and with it a heavy rain. Every airplane except one crashed in landing. Most of the fliers jumped out, using their parachutes. Some were hurt in landing. The Chinese were very kind to the American fliers and helped them to reach their meeting place.

By Monday, April 27, General Doolittle and fifty-five of his men met in a Chinese village. When they all reached Chungking on May 3, General Bissel read messages to them from President Roosevelt, General Marshall and General Arnold. Every man was given the Distinguished Flying Cross. Our President said that it was very brave of General Doolittle and his men

to fly off on such a raiding trip. It had looked to them when they left as if all might have to land in Japan or fall into the sea.

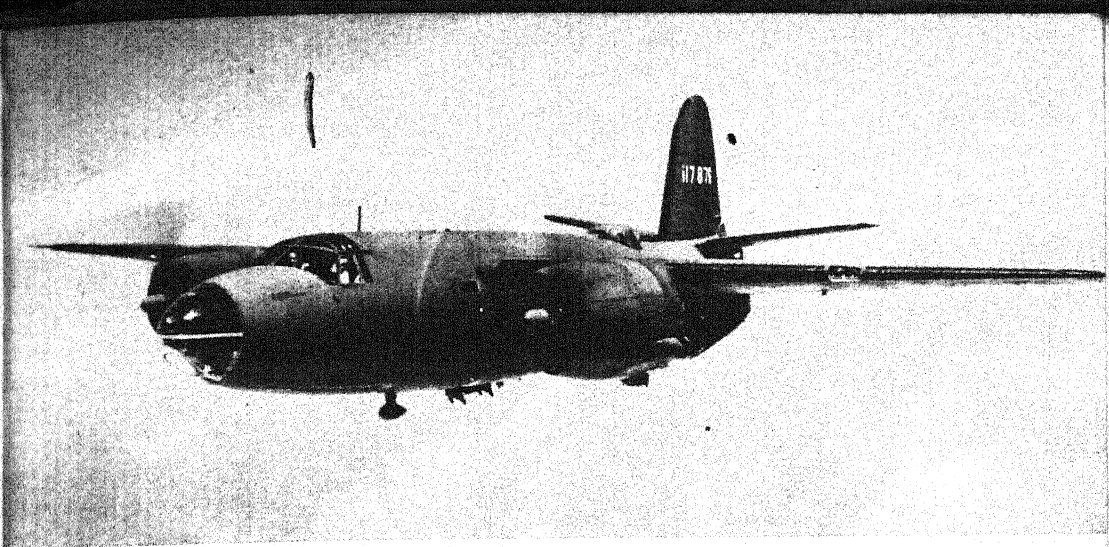
Of the eighty men who set out, sixty-four came back safely. One was killed. Two are missing. Five are being kept safely in Russia. Eight men were made prisoners by the Japanese.

The Mitchells were excellent bombers. They flew a great distance. They did their work well. The reason that they crashed at the end was that the pilots could not land them in the dark without gasoline and without airfields. Everyone felt proud of these bombers and of the courageous men who flew them.

THE MARTIN MARAUDER · B-26

The Martin Marauder, B-26, is our fastest and newest medium bomber. It is a high-wing monoplane with two engines of 2,000 horsepower each. The fuselage juts forward far beyond the engines, and it has landing gear which rises up into the plane. This is called retractable landing gear. We have seen this in many other planes.

The Army will not tell us exactly what the B-26 can do, but we have been told that it can fly with a full load at 320 miles an hour. That is very, very fast. It is faster than many fighter planes. Its range is over 1,500 miles.



Martin Marauder, B-26

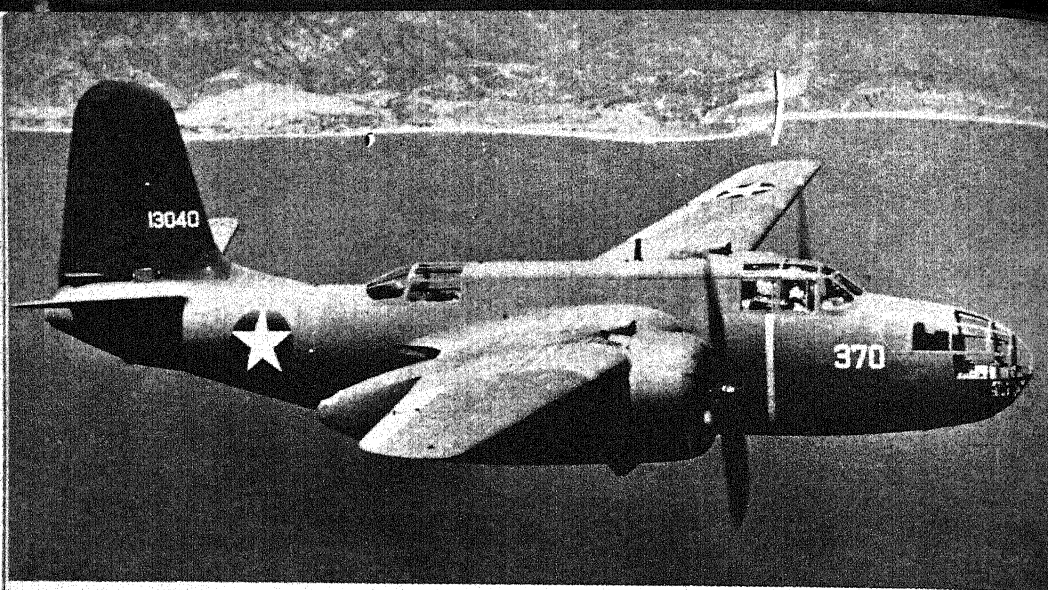
Like the Mitchell, this bomber carries a crew of five. It has a pilot, a radio man, a bombardier and two gunners. Its load is about three tons of bombs.

The Marauder is an excellent warplane. It has self-sealing gasoline tanks and good armor plate in dangerous spots.

We are told that it has more machine-gun places than have ever been made in a bombing plane. There are about eleven machine guns of .50 and .30 caliber. It has power turrets and it has guns in the nose and tail. With its load of bombs, this is a very deadly fighter.

It has even been used as a torpedo bomber. In November, 1942, one Marauder, which had been fitted as a torpedo bomber, sank a Japanese cruiser and damaged an airplane carrier.

If you look in the newspapers you will find more and more stories about this new medium bomber.



Douglas Boston, A-20

LIGHT BOMBERS

THE DOUGLAS BOSTON AND HAVOC · A-20
THE VULTEE VENGEANCE · A-31

Our light bombers are very different from our medium bombers. As we have read in the chapter on bombing, the light bombers are used for attack bombing. That is something like dive bombing. The light bomber carries bombs and it is armed with guns and cannon. It works with the ground forces and often attacks enemy tanks and troops. It does not expect to fly very high. Anti-aircraft guns cannot see it so well when it is close to the ground. It is safer and it can also drop its bombs nearer the target when it flies low.

The Douglas A-20 has made a fine name for itself in this war. The British have been using it and many pilots praise it. They say it is easy to handle and deadly in battle. The A-20 has done such good work in England as a daytime attack bomber that it has been made into a night bomber as well. The day airplane is called the Boston III and the night plane is the Havoc II.

The Havoc is like the Boston with a few changes. The Havoc is painted black. Its nose is blackened so no light will shine out in the night. The engines of the Havoc are muffled. The flames from the exhaust pipes are covered.

The A-20 is a high-wing monoplane with two engines of 1,600 horsepower. It can fly about 300 miles an hour. This plane has a fuselage that juts far out to give the pilot and his crew a better chance to see. It is important for these men to be able to see the ground clearly. The Boston (or Havoc) has heavy armor to protect it from ground guns. It carries more than a ton of bombs. It has four guns that fire forward, two free guns firing from the rear, and a cannon to use against tanks. The A-20 needs a crew of three men.

The Bostons and Havocs are being used a great deal in Africa. They were important too in the Battle of Britain. The Havoc was very good at shooting down Nazi bombers over England. Besides doing this the Havoc used to fly quietly around Nazi airports and wait for German planes to come back to base. As soon



This Vultee Vengeance has just released a bomb, which you can see a little behind it.

as the Nazi planes flashed on their lights the Havoc would let go full fire and dash away at 300 miles an hour.

The Bostons and Havocs are making names for themselves on many fronts today.

Another light bomber is the Vultee Vengeance. This is a mid-wing bomber with an engine of 1,600 horsepower. The landing gear folds up backwards and lies flat under the plane.

The top speed of the Vengeance is about 300 miles an hour, and its range is close to 800 miles. It carries a crew of two. There is a pilot and also a rear gunner who acts as radio man and as a lookout.

This plane carries about 1,700 pounds of bombs. It has a very deep fuselage with doors that swing down when the bombs are dropped.

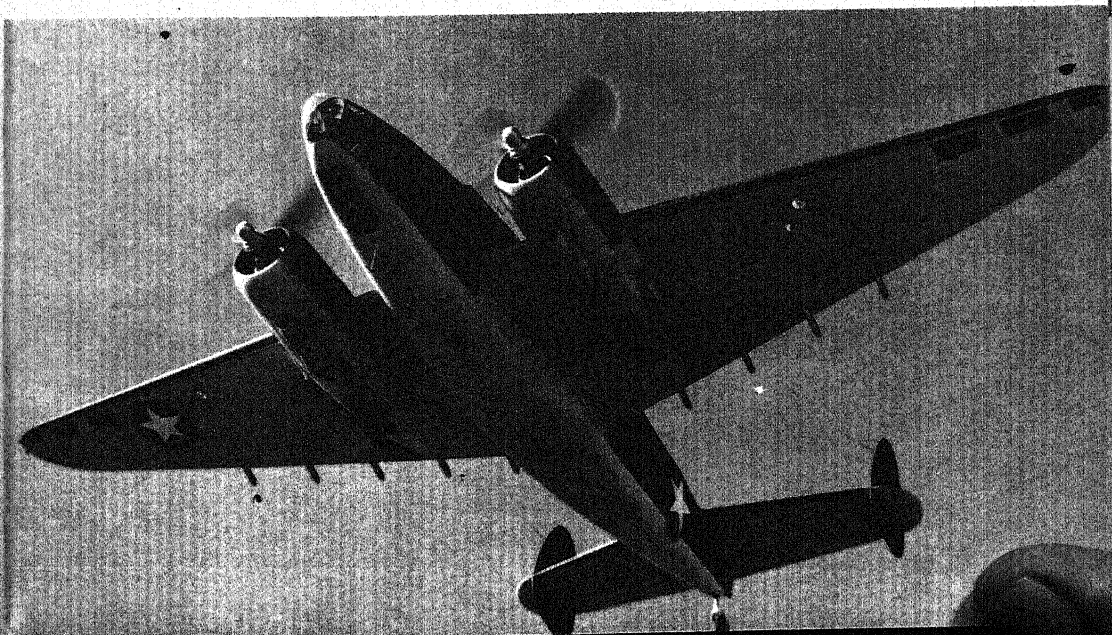
THE LOCKHEED HUDSON · A-29 (NAVY PBO-1)
THE VEGA VENTURA · B-34

The Lockheed Hudson is the war model of a big airplane that used to be a transport in time of peace. It is a mid-wing monoplane with two engines and two tail fins. The Hudson's top speed is 284 miles an hour and its range is about 2,160 miles. It flies at about 25,500 feet in the air. The wings tip up with a full dihedral slant. The fuselage is large and roomy, with two decks.

For fighting, the Hudson has two fixed guns in the nose, a gun turret near the tail and a place for shooting out of the bottom. Bombs are stored inside of the fuselage.

You can easily spot a Lockheed Hudson by the five points which stick out from the trailing edge of the wing. These little points hold pulleys and wire that

Lockheed Hudson, A-29



make the flaps on the wings slide backward or forward.

This bomber was bought by the British long before our Army used it. The RAF used it at first for scouting and observation. The British soon found that it was a good fighter and even a dive bomber. It had greater speed at some altitudes than most of the enemy planes.

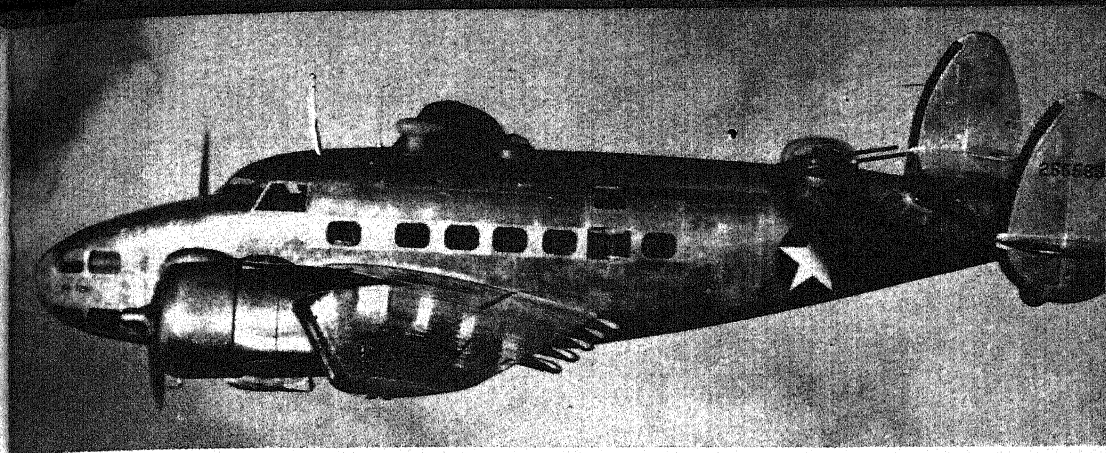
It is very hard to bring down. In one battle a Hudson was hit by several anti-aircraft guns. It had one engine shot away and part of a wing and tail, but it came safely back to base.

A Lockheed Hudson was the first plane to give the news that the big German battleship, the *Bismarck*, had left port. It is the only airplane that has ever captured a German submarine.

It has taken part in many bombings of war plants in German cities and has shown itself so useful that now we have a Navy Lockheed Hudson model for our Navy. This is called the PBO-1.

The Lockheed Hudson now has a brother, the Vega Ventura. The Ventura is one of our newest bombers. This airplane looks very much like the Hudson, but it is bigger and has several changes. It has more guns. It will fly farther than the Hudson. It carries a heavier load at greater speed. We shall read more about it in the Navy chapter, "The Vega Ventura PV-1."

We are just beginning to hear the stories of the Venturas in their first battles. Here is one report from the RAF.

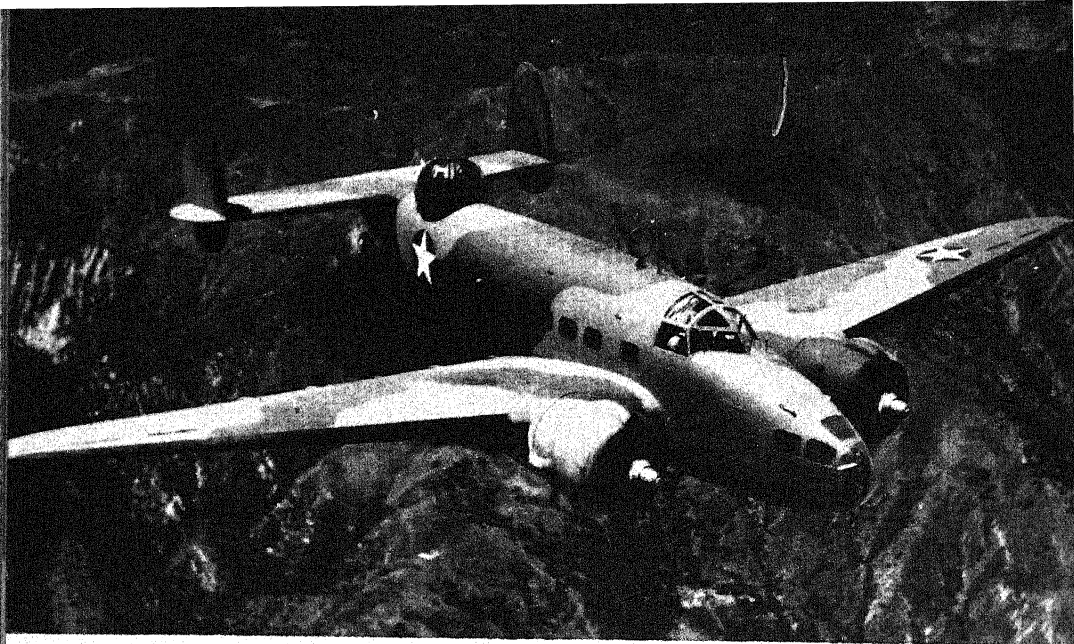


Vega Ventura, B-34

In December, 1942, Venturas made in America were flown by men of the RAF in their first large-scale action. This was a daylight attack on enemy war plants. There were several waves of bombers and the whole last wave was made up of Venturas. It is always most dangerous to be in the last wave because the enemy fighters have time to come up to attack the last wave after the first waves have flown over. The pilots who flew the Venturas thought that it was an honor for the Venturas to have the most dangerous place.

The Venturas were led by Wing Commander Donald Young. He had his tailplane painted yellow and his tail light on so that the squadrons could follow him easily. He flew low over the rough sea.

When the Venturas reached the war plants, they flew so low that they had to "leap frog" over the tall buildings. Several of the Venturas brushed through the branches of tall poplar trees. One Ventura flew so low that mud splattered the bottom of the fuselage. The



Lockheed Hudson, A-29

pilot who flew it said, "Even a Ventura couldn't go lower than that—not with real safety."

The enemy fired their anti-aircraft guns and sent up their fighters. Several Venturas were badly torn, but they stood up very well under fire. One Ventura reached home safely with seven feet torn off its left wing.

At the end Wing Commander Young said: "The Venturas did all that we could ask of them and no less than we expected."

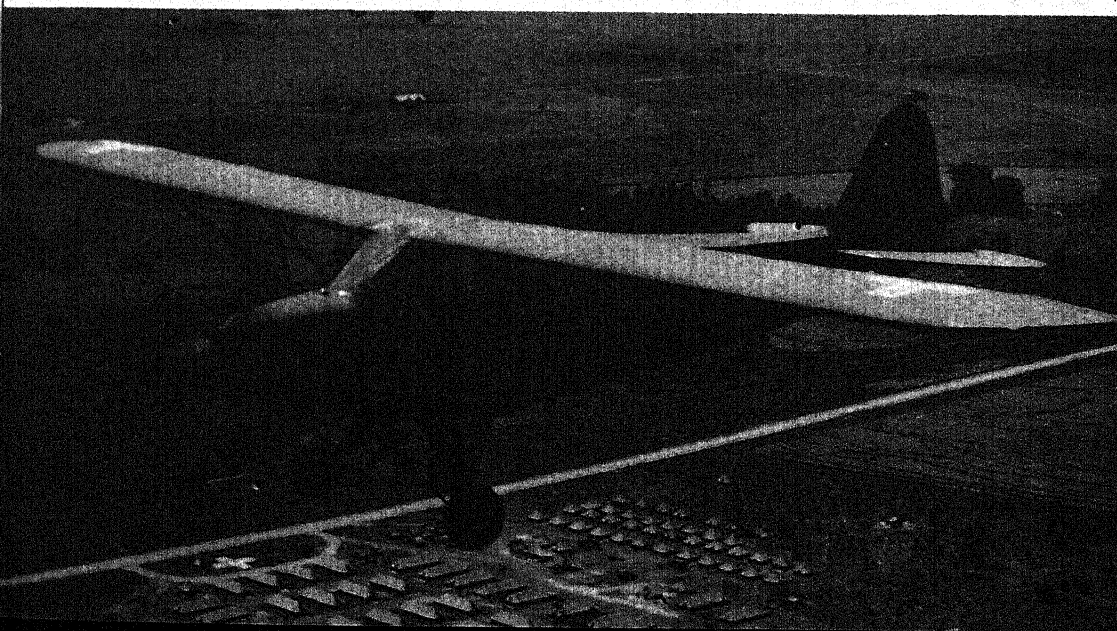
Chapter 3 · PLANES THAT WORK WITH THE GROUND FORCES

OBSERVATION PLANES

WE know that the Army air force has three parts, the fighters, the bombers and the planes that work with the ground forces. The fighters are important because they keep enemy bombers from reaching their targets and they protect our own bombers. The bombers are important because they carry the shells right to the targets. Now we shall see why the planes that help the ground forces are important.

One kind of airplane that works with the troops is sent up to look around. This is called an observation

Vultee Vigilant, O-49



plane. Observation planes are the eyes of the big guns. They spot the gunfire, tell the gunners the right range and tell them whether or not they have made hits. They do this by radio as they fly above. Often observation planes are sent up in the air to see whether the troops and guns are hidden under trees and shelters so that enemy planes cannot see them. Often observation planes are sent to take pictures of the enemy's country. They must take pictures of war plants and forts and they must see if enemy soldiers are being moved.

You can easily see that observation planes are very important when an attack is planned. No army can make plans for an attack unless it knows about the enemy camp.

Observation planes must be able to fly very slowly. Men could not see very much if they flew by at 300 miles an hour, and they could not take any pictures. These airplanes must be able to fly fast enough to escape if they are chased and they should have a long range. No pilot wants to come down for gasoline in the enemy's country. Observation planes must also be able to fight a little to protect themselves if they are attacked, so they carry machine guns.

We have a number of observation planes which you may see sometimes overhead. The Army letter P is for pursuit, B is for bombing, A for attack and O is for observation.

The Vultee O-49, the Vigilant, is one of the first

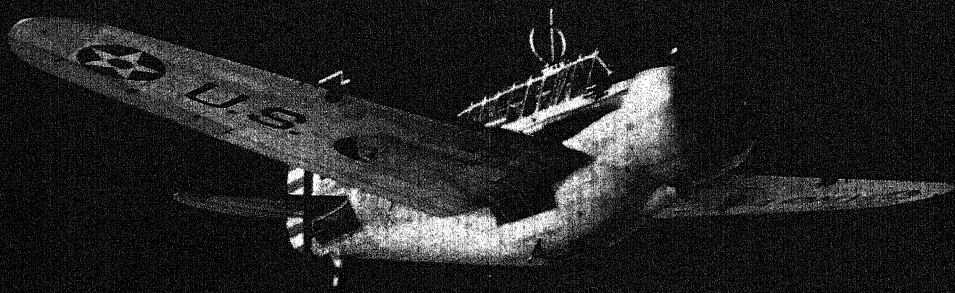
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good observation planes of this kind. It is a high-wing monoplane with dihedral wings. Having the wings high on the fuselage gives the crew more chance to see the ground. The cabin is covered with bullet-proof glass instead of solid walls, and it rises up above the wings. This cabin carries two men sitting one behind the other. The plane is long and narrow but it has a big tail. The landing gear does not retract.

The Vigilant has an air-cooled engine with 285 horsepower. It can fly very slowly without falling because it has slots which can open all along the wing. These slots let the air go through the wing and they help to hold the plane up when it is not going fast. There are flaps on the edge of the wing which can also slow down the airplane. The U. S. Army has hundreds of these Vigilants and a large number have been sent to the RAF.

Another observation plane is the Stinson L-5, the Sentinel. This is one of the newest observation planes. It is a high-wing monoplane which looks rather like the Vigilant. It has a 190-horsepower engine and can fly as fast as 140 miles an hour. It can also go slowly and still stay high in the air. It is often called the "flying jeep."

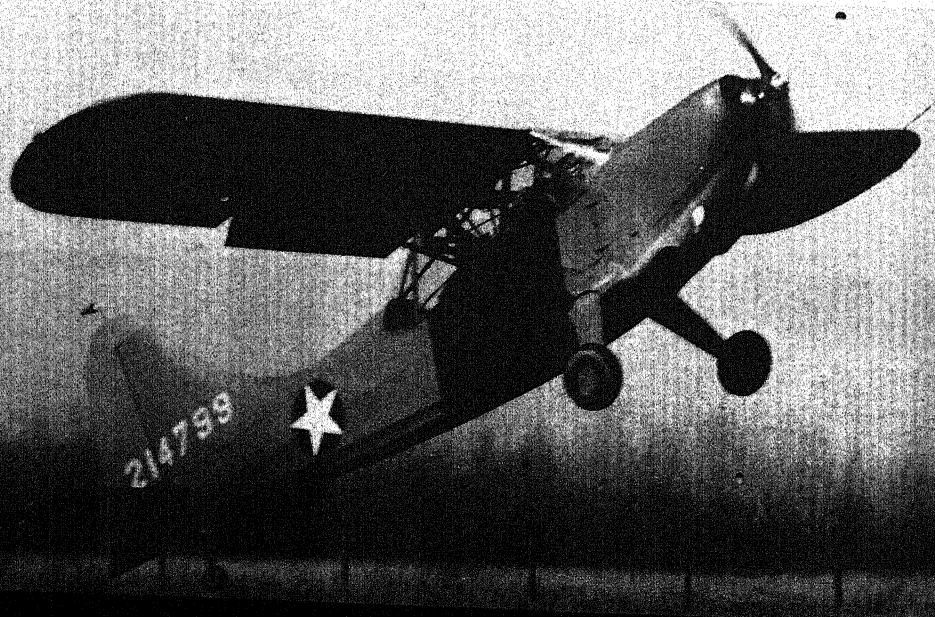
North American, O-47



The Ryan YO-51, the Dragonfly, is one of the most interesting of the new airplanes. It was planned for observation and short range work. It can land and take off in very small fields and it may take the place of motorcycles in carrying officers from place to place. It is often called the "Flying Motorcycle." This plane is a high-wing monoplane with one engine of 420 horsepower. It can fly about 150 miles an hour. It carries two people. It can fly very slowly and also fairly fast. It can climb almost straight up in the air and it can land in a small place. This is a very useful plane to the Army.

The North American O-47 is quite different from the Dragonfly. The O-47 is a mid-wing monoplane with a retractable landing gear. It carries three men and has a long cabin that looks like a greenhouse on top. The fuselage is very deep and has room for one man to lie on the floor and spread out his maps while

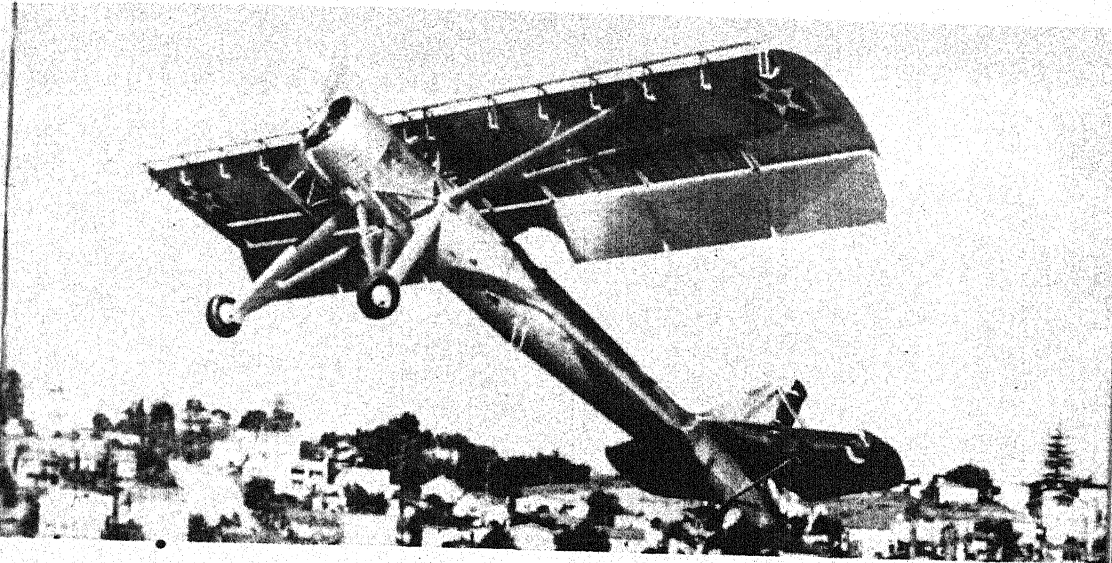
Stinson Sentinel, L-5, "The Flying Jeep"



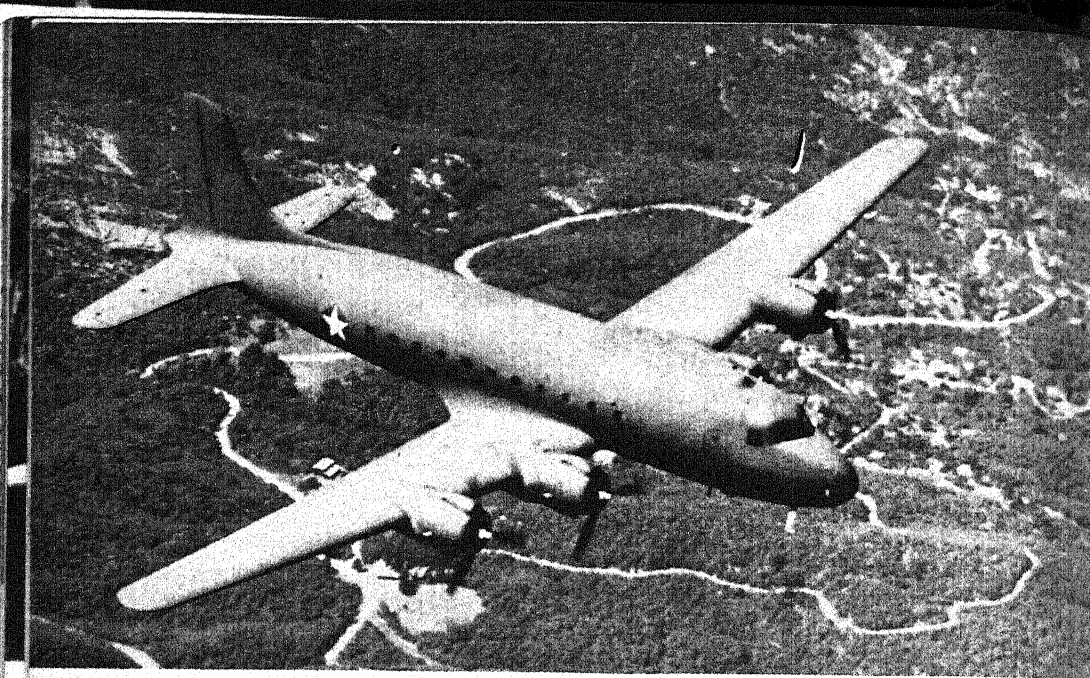
he looks through the bottom at the country below. The men who made this plane say that it was "built around the observer."

There are many other observation planes. Some of them are very light planes called grasshoppers.

If you know of other models, be sure to write about them in your scrapbook.



Ryan Dragonfly, YO-51



Douglas Skymaster, C-54

ARMY TRANSPORTS

THE DOUGLAS SKYMASTER · C-54

THE CURTISS COMMANDO · C-46

THE CONSOLIDATED LIBERATOR EXPRESS · C-87

THE LOCKHEED CONSTELLATION · C-69

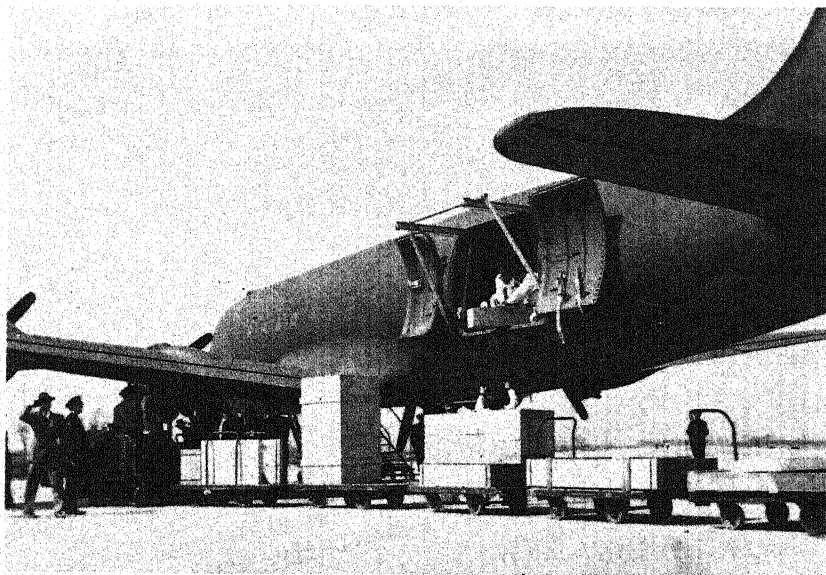
In a war, the airplanes that do the fighting are the ones about which we hear most. But we must remember that these airplanes are not doing all the work. We have seen how useful are the observation planes. Airplanes used to train fliers are very important, too. Some of our most useful airplanes are the transport planes.

(In the Navy, transport planes may carry men and

supplies and mail to ships at sea or to far-off bases. They may tow targets for gun practice.

In the Army, transport planes carry men and supplies. They may even take parachute troops over the fields where they are to fight. When a transport flies near the enemy it is usually protected by fighter planes.

Some of our transport planes are made by companies that used to make airliners in peace time. The Douglas C-54 Skymaster is based on the Douglas airliner DC-4. The C-54 is one of the Army's large new transports.



Unloading a Douglas Skymaster

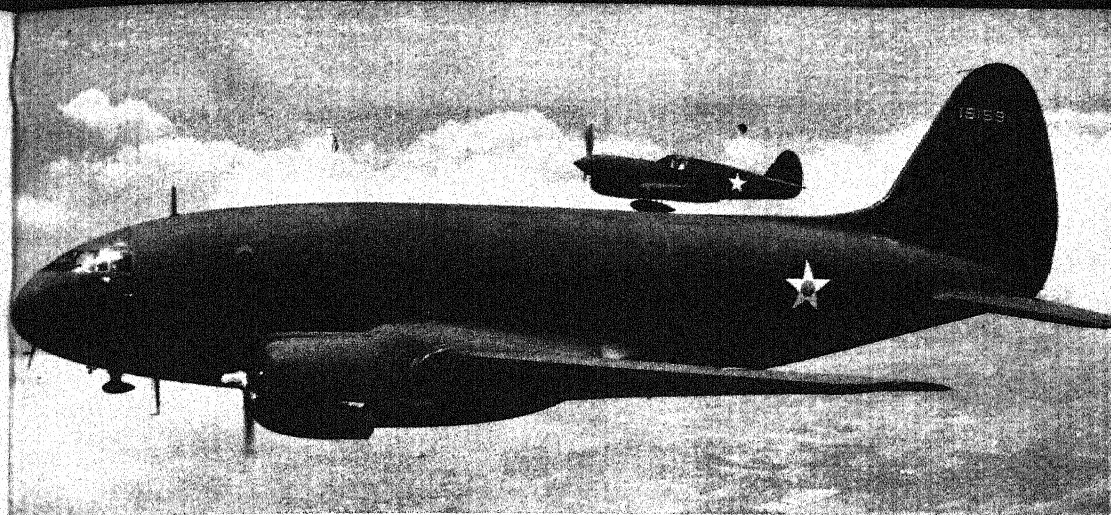
It is 93 feet, 10 inches long and it has four engines of 1,350 horsepower each. Its top speed is 200 miles an hour at 15,000 feet in the air, but it can fly as high as

26,600 feet. This airplane can carry more than fifty soldiers.

The Curtiss C-46 Commando is not so large as the C-54, but it is probably the biggest airplane with two engines in the world. It can transport more than thirty-six soldiers with their packs and guns, or else it can carry jeeps and cannons. The Commando is a mid-wing monoplane.

Loading a Curtiss Commando. Men and even jeeps can be carried in this plane.



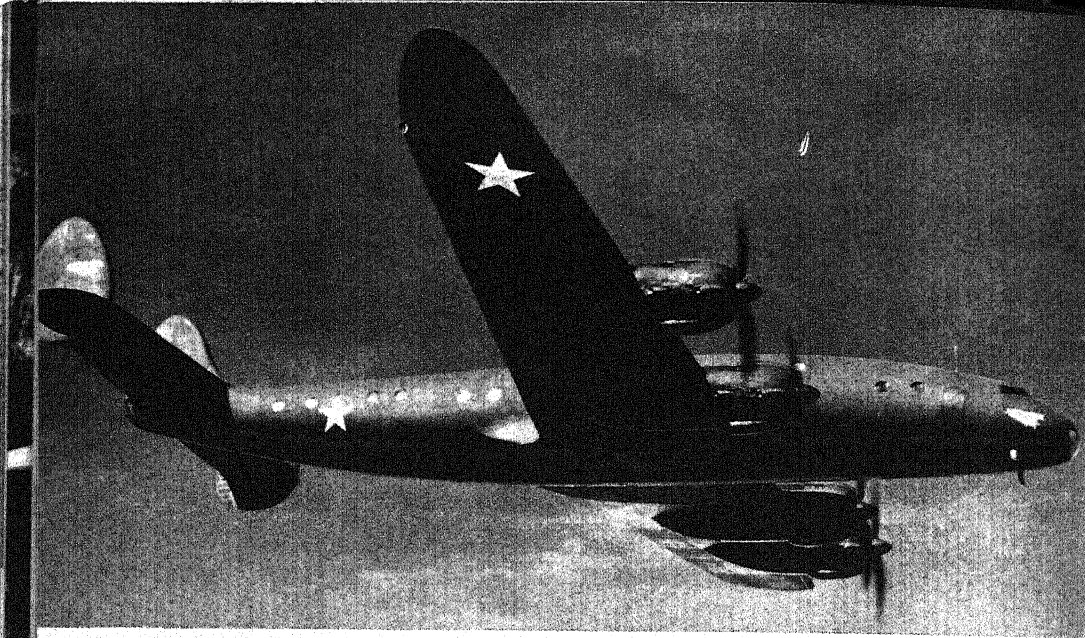


Curtiss Commando, C-46. The Warhawk, P-40, in the background looks very small beside this giant transport.

We have read about the new transports that are being made from Consolidated Liberators. These have the letters C-87. The Liberator has already proved itself a fine airplane. It is fast and easy to handle. It carries a heavy load. It flies high and fights well. The C-87 is a fast and safe transport, and has been used on long trips. It took Mr. Wendell Willkie to Russia and China. It has carried supplies to Africa and the Middle East.

Now we have a very large new Army transport. It was put out by the Lockheed Company and made its first flight on January 9, 1943. The Lockheed Constellation, C-69, is the biggest, fastest and most powerful land transport ever built in America.

The Lockheed Constellation is a low-wing monoplane. It has four engines of 2,000 horsepower each. We do not know just how fast the plane can go, but the Lockheed Company says that when the Constella-



Lockheed Constellation, C-69

tion flies with only half its power, it goes one hundred miles an hour faster than airliners usually fly.

The Constellation flies most of the time at 20,000 feet, but it can climb to 35,000 feet. If one engine stops, the airplane can fly at 25,000 feet with the other three engines. If two engines die, the other two will carry the plane at 16,500 feet.

Flying with a full load, this big transport uses only one gallon of gasoline a mile.

In the air, the Constellation looks like a big shark. It is long and round and smooth.

The wing of the Constellation is the same kind of wing that is used in the Lockheed Lightning, but it is much larger. In fact, when the Constellation was first shown to the public on January 9, a P-38 was resting under the wing of the giant Constellation.

The tail of this new transport has three large fins to make the plane very steady.

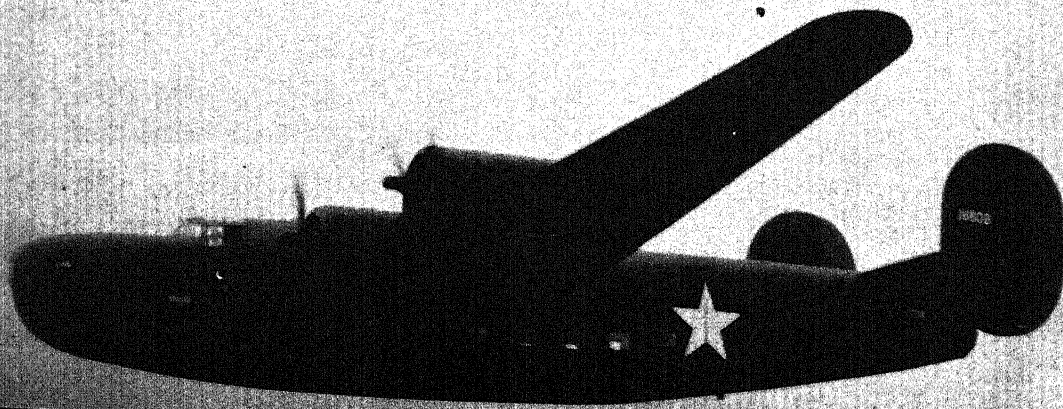
There are many interesting things about the Constellation. There is a new way to keep ice from forming on the wings. This is done by a hot-wing de-icer. The de-icer uses some of the hot gases from the exhaust pipes to heat the leading edge of the wings.

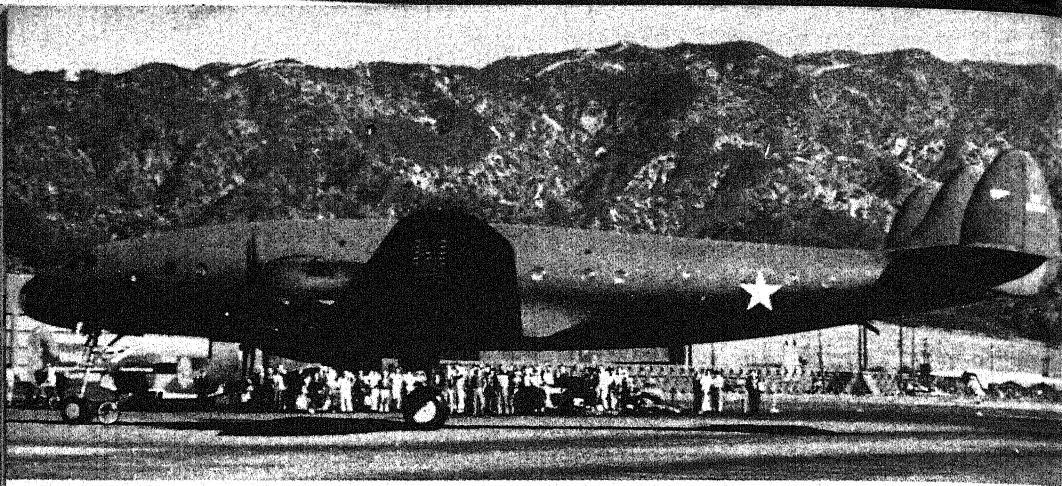
The cabin of the Constellation has two superchargers to keep the air comfortable at any altitude. These superchargers pull air into the cabin when the plane climbs high. They make the air just as thick as it is at the level of the sea. They also cool the air on hot days or warm it on cold days.

The Constellation has a crew of nine men. It can carry sixty soldiers or else it could carry fewer men and have beds for twenty-two people to sleep in. It can even carry a light tank.

We do not know the exact speed or range of this giant ship but we do know that it can fly from Los Angeles to New York in about eight and a half hours.

Consolidated Liberator Express, C-87





Lockheed Constellation, C-69, standing on the ground. Its wheel is almost as tall as a man.

It can fly from California to Hawaii in twelve hours without stopping for more gasoline.

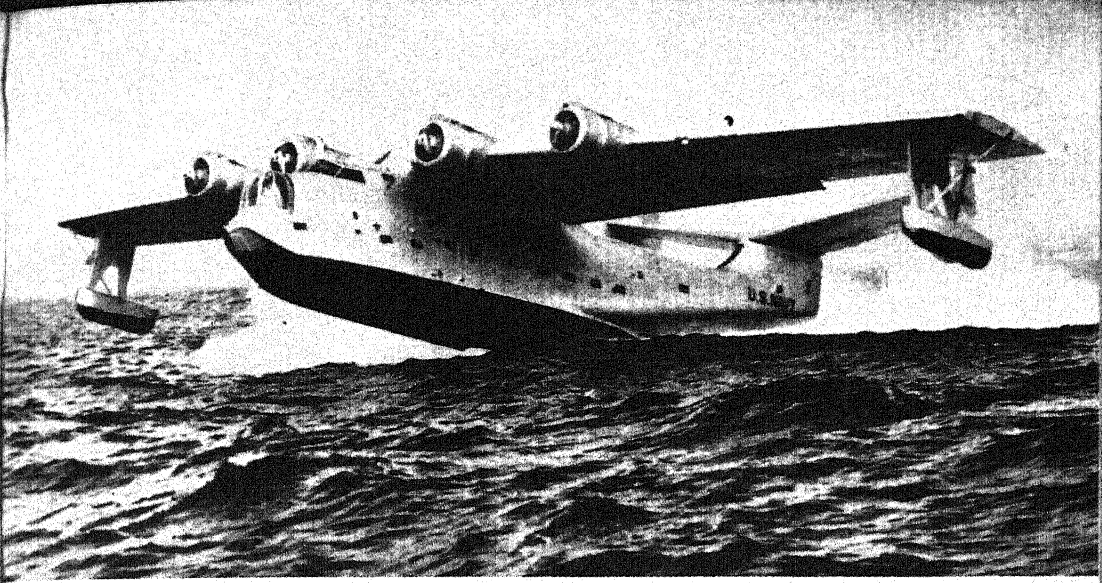
After the war this airplane will tie all the countries closer together. It will seem a short trip to fly across the north pole to any country on the other side of the world.



PART II

*Divisions of the United States Navy
Air Force*





Consolidated Coronado on the surface of the ocean

Chapter 4 · TYPES OF NAVY PLANES

THE U. S. Navy has an air force of its own. This is because it has to fight over water instead of land. Navy airplanes are not exactly like the Army planes. Most of the small Navy planes have their bases on warships or carriers.

Carrier-based airplanes must be able to do a great many things. They are often spotted first by the enemy so they must be able to make a quick take-off and to climb very fast. They must fly high because in any fight the airplane on top has the best chance of winning. They must be able to fly as fast as the enemy fighter planes which have land bases. Navy planes must carry more gasoline than Army planes. While they are up in the air, their carriers often sail away. This means

that they may have to fly much farther going back to base.

Navy airplanes must have a low landing speed. They should also have hooks on the bottom of their fuselages so that the wires on the carrier deck can catch them and slow them down. The wires are called arresting gear and the hook is called an arresting hook.

Navy airplanes need more powerful radios than Army planes, and they often have large rings of wire on the outside of the plane—the radio antennae.

There are no liquid-cooled engines in the Navy. This is because the Navy does not want to risk any forced landings. If there is a small hole in the liquid-cooled engine, the liquid drips out and the airplane has to come down.

All Navy airplanes do not have their bases on carriers. Many Navy planes are flying boats. These flying boats are called patrol bombers. Patrol bombers have to carry heavy loads of bombs and they must be able to fight like heavy bombers, but they have a different kind of work to do. The patrol bombers fly great distances looking for the enemy. They have to go alone and they must be able to fight all by themselves. They need good guns and good armor. They must fly high. They must be easy to handle and strong enough to stand bad weather and even stormy seas. These Navy bombers are not so fast as the Army heavy bombers.

Like the Army airplanes, Navy planes are divided

into classes. Each class has its own work to do. There are fighters, bombers, transports, and scouting planes.

In the Navy, the markings tell a good deal about the airplanes. The first letter tells the most important work of the plane. There is F for fighting, S for scouting, B for bombing, P for patrol, O for observation. If two letters are used they tell two kinds of work the plane is to do. You may see the letters PB, meaning "patrol bomber," or you may see SO, meaning "scout observation."

In the Navy markings, a letter is added to tell the name of the company that made the airplane. Here is a list so that you will be able to see each company's letter.

Manufacturers are:

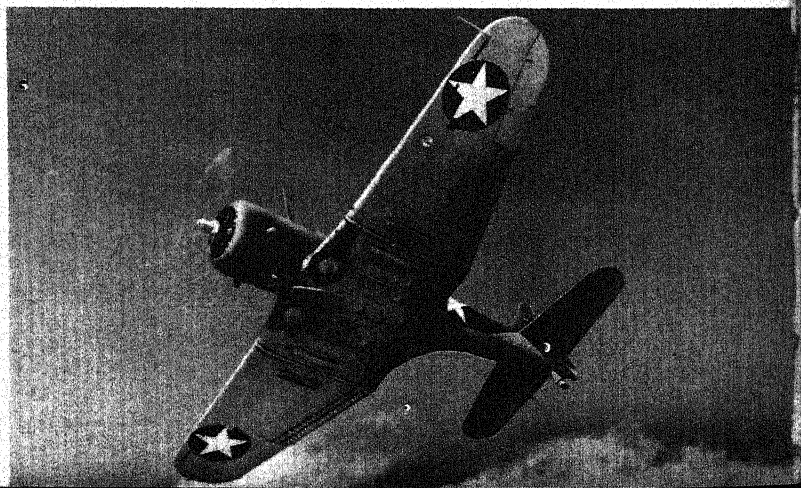
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|---------------------------------|--|
| A. Brewster Aeronautical Corp. | M. Glenn L. Martin Co. |
| B. { Boeing Airplane Co. | N. Naval Aircraft Factory |
| { Beech Aircraft Co. | O. Lockheed Aircraft Corp. |
| C. Curtiss Airplane Div. | P. Spartan Aircraft Co. |
| Curtiss-Wright Corp. | R. { W. L. Maxson Corp. |
| D. Douglas Aircraft Co. | { Ryan Aeronautical Co. |
| E. Bellanca Aircraft Corp. | S. Vought-Sikorsky Aircraft |
| F. Grumman Aircraft Eng. Corp. | T. El Segundo Plant, Douglas Aircraft Co. |
| G. Great Lakes Aircraft Corp. | U. Vought-Sikorsky Aircraft Div. United Aircraft Corp. |
| H. Hall-Aluminum Aircraft Corp. | |
| J. North American Aviation | W. Waco Aircraft Co. |
| K. Fairchild Aircraft Corp. | X. Experimental |
| L. Bell Aircraft Corp. | Y. Consolidated Aircraft Co. |

If you saw the letters **PBY-1**, you would know that the plane is a patrol bomber made by the Consolidated Company. The number 1 shows you that it is the first model of the series. If changes were made in the airplane, the next in that series would be **PBY-2**. You would also know when you look at these letters that this airplane is the first model the Consolidated Company made for the Navy. If the Consolidated made another model, the letters would be **PB₂Y-1**. The number before the company's letter tells the number of the model, the number at the end tells how many times the model has been changed. Here are some examples: The Helldiver is **SB₂C-1**: Scout Bomber, second model made by Curtiss, and first in this series. The Wildcat is **F₄F-4**: a fighter by Grumman, the fourth fighter Grumman has made, and the fourth model in the series of Wildcats. The Hellcat is **F₆F-3**: the sixth fighter made by Grumman.

In both the Army and the Navy **X** means experimental. The plane is still being tried out.

(During the war the Marine and Coast Guard airplanes are all part of the Navy air force.)

**Douglas
Dauntless,
SBD-3**



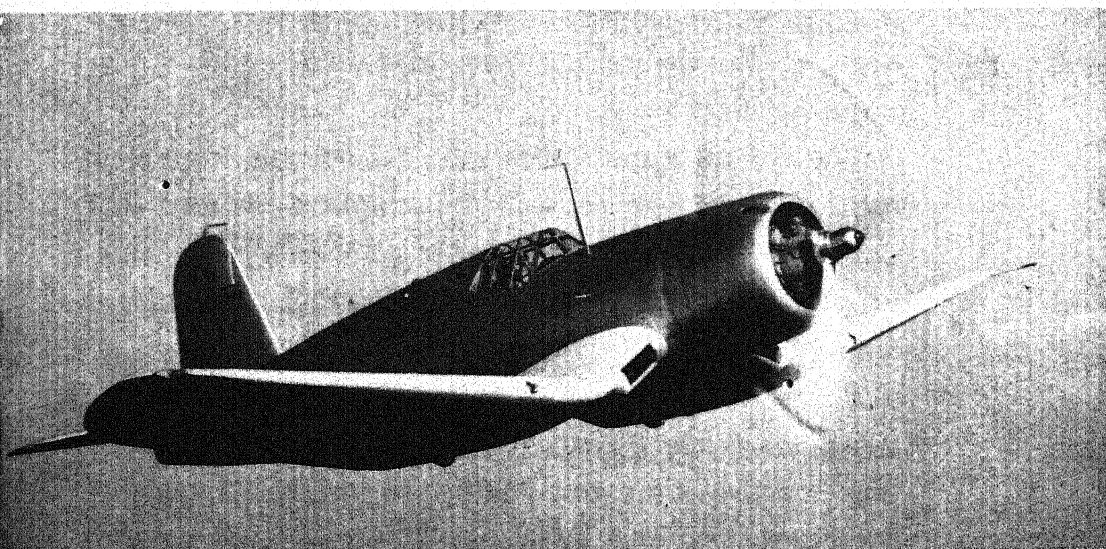
Chapter 5 THE FIGHTERS

THE VOGHT-SIKORSKY CORSAIR · F4U-1

THE U. S. Navy fighters are very important, and one of the best of these Navy planes is the Vought-Sikorsky F4U-1, the Corsair.

The Corsair was first tried out in 1940. It is a very new plane and a great many things about it are secret. This plane is called a fighter but it can do so many things that it may be used as a dive-bomber fighter.

The Corsair is a low-wing monoplane. Its wings look like the wings of a seagull inverted. Inverted means turned upside down. Inverted gull wings look like those on the plane directly below.



Vought-Sikorsky Corsair, F4U-1. Note inverted gull wings.

The wings bend backwards, too, and they make it easy for the pilot to see the deck of the aircraft carrier when he lands.

The Corsair has one of the most powerful engines ever carried by a plane with one seat. It carries a Pratt and Whitney air-cooled engine with 2,000 horsepower and it has a top speed of 390 miles an hour.

Even though the Corsair can fly very fast, it can slow down when it wants to land on the deck of an aircraft carrier. This is one of the best things about the Corsair. It is very important for Navy planes to be able to land slowly, or else they might go shooting right off the edge of the deck when they were trying to land.

We do not know how high the Corsair can fly but we think it must be able to fly very high with such a powerful engine. We do not know, either, just how many guns the Corsair carries, but guess that it has six heavy machine guns and there may be one or two cannons that fire shells.

Because the Corsair has such a powerful engine, it can carry more armor than most fighter planes without losing speed. After the first six weeks of fighting not one pilot had been hit in the cockpit of a Corsair and not one Corsair had fallen in flames.

Pilots are very pleased with the Corsair as a high-altitude fighter. They say it will outfight any pursuit plane in the Southwest Pacific. In one battle twenty-five Zeros came over in two waves. Up zoomed our air-

planes to meet them at between 15,000 and 27,000 feet in the air. There were Corsairs, Warhawks, Airacobras, and Lightnings. The battle lasted twenty minutes and the Zeros never had a chance because of the speed and fire power of the Corsairs. Seventeen Zeros were shot down. Sixteen of the Zeros were shot down by Corsairs although the Corsairs made up less than half of our planes in that battle.

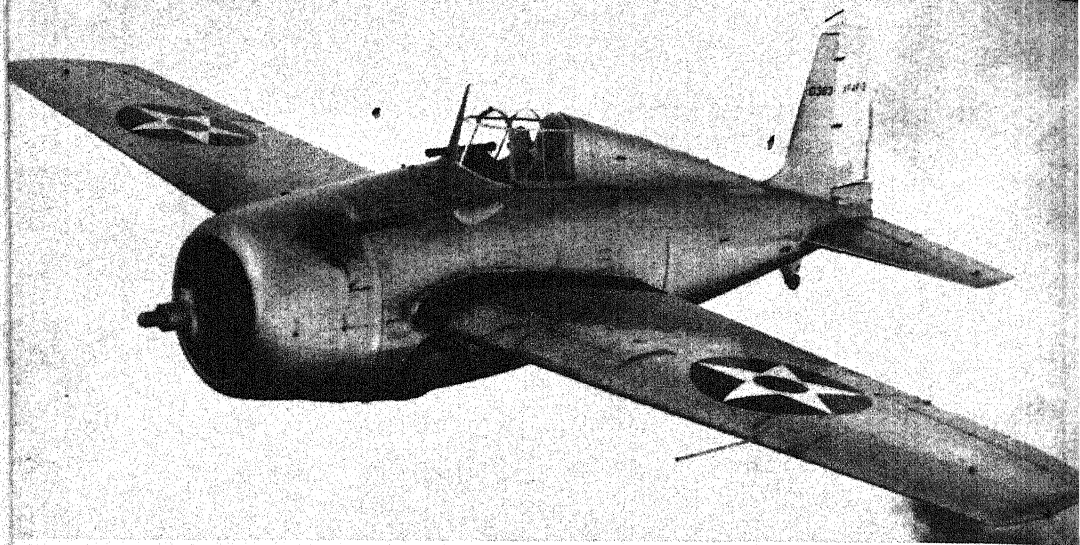
After a fight, one flier said, "I ran out of oxygen at 20,000 feet, dived to 15,000 feet and came out on the tail of a Zero ahead of another Corsair. After one short burst the Zero blew up. I leveled off against another Zero—right on his tail. He started climbing with his engine smoking. I zipped past him. He lit out for home. I tailed him and shot him down."

At last we have a fighter that is faster than the Zeros and just as maneuverable. It has better armor and a longer range. The Navy expects great things of the Corsair.

THE GRUMMAN WILDCAT · F4F-4

The Grumman "Wildcat" has already made a name for itself in this war. This plane has fought in the Mediterranean Sea, in Africa, and in the Pacific Ocean. In England, the Wildcat is called the Martlet.

The Wildcat is a mid-wing monoplane with only one seat. The wings have a dihedral slant.



Grumman Wildcat, F4F-4

The Wildcat can take off from land but it is used mostly on aircraft carriers. It is very good on aircraft carriers because it does not take up so much space as some other planes do.

The Wildcat is not big. It is only twenty-nine feet long and it looks rather stubby. The wings of the Wildcat fold up so that the plane is only about one-half as big when it is stored below deck.

The engine of the Wildcat is a powerful Pratt and Whitney air-cooled engine with 1,200 horsepower. We do not know just how fast the Wildcat can fly. Someone has said that the plane can take off in about seven seconds and climb 4,500 feet a minute at full speed.

This plane is very easy to fly. When a plane is easy to fly, we say it is easy to maneuver, or that it is highly maneuverable. This means that the plane is easy to steer, to turn, to swoop or bank or dive. Pilots always talk about how "maneuverable" a plane is.

The Wildcat is a good fighting plane because it is maneuverable. It is also well armed. It carries guns in its wings and two machine guns which fire through the propeller. Besides its guns, the Wildcat can carry light bombs.

Before this war is over we shall hear many stories of brave deeds. In airplane battles each pilot has to decide a great many things all by himself and very often he has to fight all by himself. One story we have heard is about Lieutenant Commander Edward O'Hare. He shot down five Japanese bombers when they tried to raid a U. S. plane carrier. Lieutenant Commander O'Hare was flying a Wildcat.

THE GRUMMAN HELLCAT · F6F-3

The Grumman Hellcat is a new Navy fighter. It looks very much like a bigger Wildcat. It is thirty-three feet, ten inches long and eleven feet, one inch high. It has a wing span of forty-two feet and ten inches. Like the Wildcat and the Avenger, the Hellcat has folding wings to save space on a carrier.

This plane has an air-cooled engine with 2,000 horsepower. Its top speed is around 400 miles an hour. It can climb 3,650 feet a minute and it can fly as high as 43,800 feet. It usually flies at 36,000 feet. When it lands, it can slow down to seventy miles an hour and it can take off with a full load in four seconds.



Grumman Hellcat, F6F-3

The Hellcat can fly 1,350 miles without coming down for more gas. With an extra gasoline tank, it has a range of 2,000 miles.

The Hellcat has good protecting armor and it has a bulletproof windshield and self-sealing gasoline tanks. It has six .50 caliber machine guns and can also carry a 2,000-pound torpedo. This plane is so steady that it is a very fine platform for firing guns.

There are some new things about the Hellcat. There is a flap which works with the air-speed indicator. This flap automatically opens out as the plane's speed is low-

ered. Because of this, the plane can slow down and make a very tight turn. The Hellcat can do all of the things a Zero can do, but it is much safer.

Another new thing about the Hellcat is its exhausts, which are called ejector exhausts. The exhaust pipes carry the exhaust gas through a very small opening. This opening is so small that it makes the escaping gas shoot out like a rocket. The gas shoots out behind with such force that it pushes the airplane ahead faster. The exhaust gas adds to the speed of the plane.

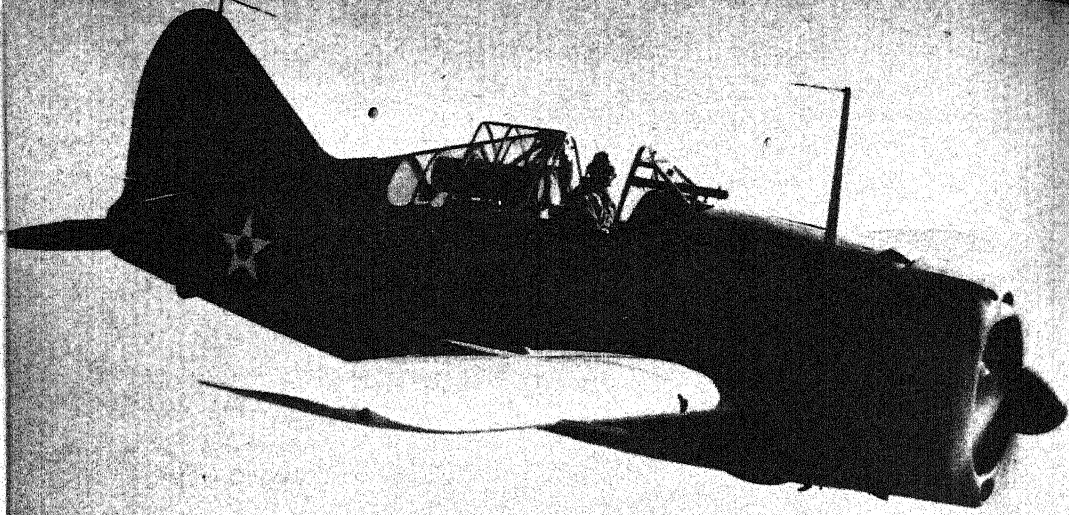
Although the Hellcat is a carrier-based plane, it can do everything that we expect of any land-based airplane. We shall certainly hear great things of this new Navy fighter.

THE BREWSTER BUFFALO · F2A-2

The Brewster Buffalo, F2A-2, is another Navy fighter. It has been given a nickname—the Flying Barrel—because it is so stubby. We know that the Navy likes short airplanes because they do not take up much room on a carrier. This plane is only twenty-six feet long.

It is a mid-wing monoplane with one seat. When a plane has only one seat, we call it a single seater, or we say that it is single-seated.

The Brewster has a Wright Cyclone air-cooled engine with 1,200 horsepower. It has about the same



Brewster Buffalo, F2F-2

speed as the Grumman Wildcat. It can go around 350 miles an hour when it is as high as 15,000 feet in the air.

The Buffalo has a very wide range. It can go about 1,500 miles without coming down for more gasoline. That is one of the best things about this fighter.

The Buffalo carries at least six machine guns. It has two in each wing and two on top. The Navy will not tell exactly how many guns a plane has, and perhaps more have been added to the Buffalo.

American and British pilots like this plane very much because it is a deadly fighter and it is also highly maneuverable. The Buffalo is very good at breaking up the formation of enemy bombers before the bombers can reach the battle line of our fleet. The Buffalo often fights off enemy fighting planes while our bombers attack the enemy's fleet.

Chapter 6 · THE BOMBERS

SCOUT BOMBERS

THE VOGHT-SIKORSKY VINDICATOR · SB2U-3

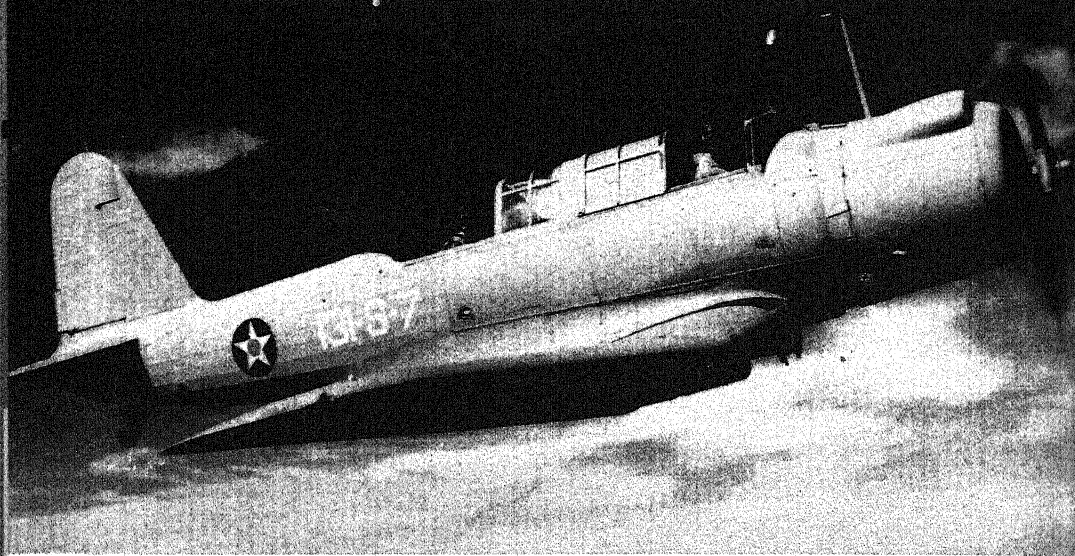
THE BREWSTER BUCCANEER · SB2A-2

SCOUT bombers are the dive bombers of the Navy. These airplanes are based on carriers. They have to be very strong to stand the sudden landings on carrier decks and also to be able to pull out of very steep dives. In many battles of this war the dive bombers have shown over and over again how strong they really are. One dive bomber landed safely with 214 bullet holes in it.

Often these planes are sent up in the air as scouts with a big load of gasoline and no bombs. If they spot enemy ships, they report to the carrier by radio and other dive bombers go out to fight carrying bombs and less gasoline.

All scout bombers carry two men—a pilot and a gunner. The gunner keeps watch from behind and shoots the machine guns. He also uses the radio.

We have four important models of scout bombers in the Navy: the Vought-Sikorsky Vindicator, the



Vought-Sikorsky Vindicator, SB2U-3

Brewster Buccaneer, the Douglas Dauntless and the Curtiss Helldiver.

The Vought-Sikorsky Vindicator, SB2U-3, is a low-wing monoplane. The dihedral slant of the wings begins about one-third of the way from the fuselage. The plane is about thirty-four feet long with a wing span of forty-two feet, which makes it valuable because it is very important for carrier-based airplanes to be small.

This plane has an engine of 850 horsepower. It can fly about 260 miles an hour and can cover more than 725 miles without refilling its gasoline tanks.

The Brewster Buccaneer, SB2A-2, is called the Brewster Bermuda in the RAF. The Bermuda is a land-based plane, but our Navy Buccaneer is based on a carrier. This is a fast, long-range dive bomber which

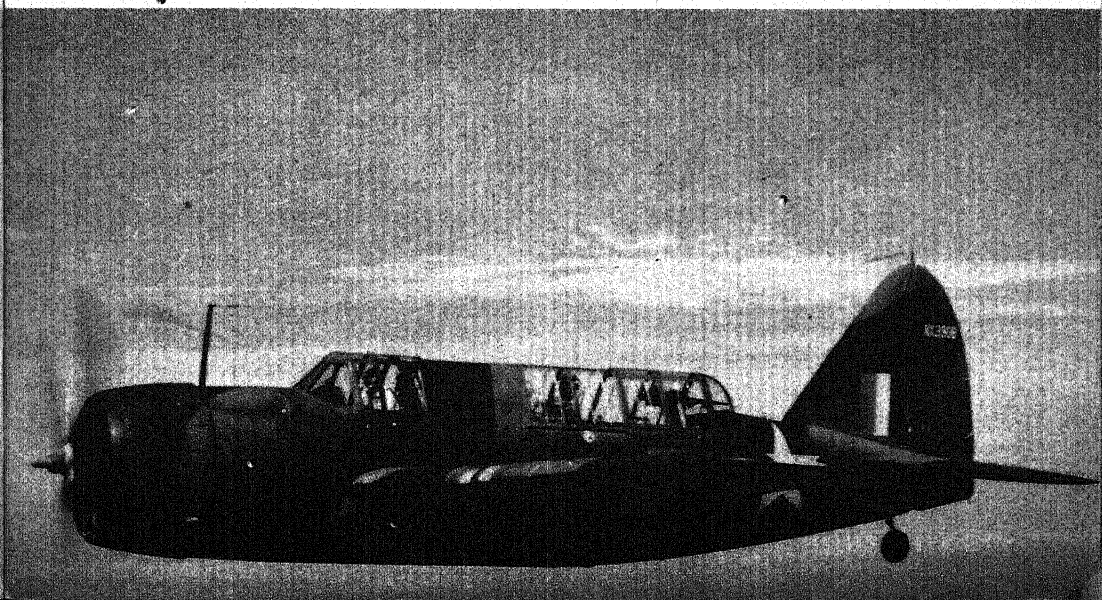
carries a heavy load. It has an engine of 1,600 horsepower. We do not know its top speed but we do know that the Buccaneer is faster than the German Stuka. It has a range of 700 miles.

The Brewster is different from many scout bombers because it carries its bombs inside the fuselage. This gives the plane a fine streamline. Other planes keep their bombs under the fuselage or under the wings. This makes a great deal of extra drag in the air which slows them down. The Buccaneer carries a very large bomb load of 1,000 pounds.

The Buccaneer has flaps to slow its speed in dives. It has bulletproof oil and gasoline tanks, and bulletproof windshields. There is good armor-plating for protection, and a power-driven gun turret just behind the cabin.

This airplane has already made a name for itself with the RAF in the Dutch East Indies.

Brewster Buccaneer, SB2A-2



THE DOUGLAS DAUNTLESS

Navy · SBD-3

Army · A-24

The Douglas Dauntless is one of our oldest and best dive bombers. It has proved itself such a good fighter that the Army, too, is using it, as the A-24. The Army model has a changed rear wheel and it has no arresting gear, but otherwise it is just like the SBD-3.

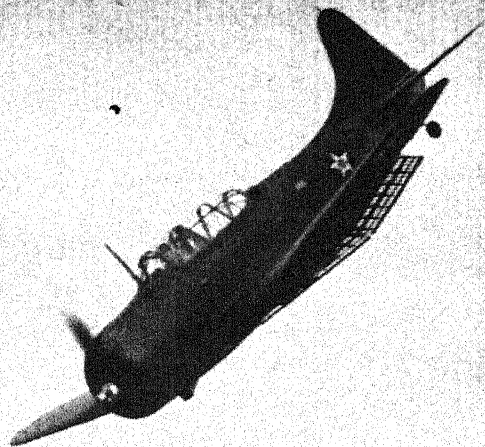
The Dauntless is a low-wing monoplane with one engine of 1,200 horsepower. It carries two men sitting one behind the other under bulletproof glass covering. It is one of the dive bombers with a special thing called an automatic pilot. The automatic pilot pulls the airplane out of its dive. This is very useful because sometimes pilots lose their senses and faint for a few seconds after a steep dive. This fainting spell is called a black-out. The automatic pilot saves the plane from crashing.

The Dauntless without bombs, when it is on a scout, can go about 257 miles an hour, and it flies well at 28,900 feet in the air. It has a range of over 1,100 miles.

When it carries a full load of bombs, its speed is 246 miles an hour, its range is 520 miles and it can fly 26,850 feet high.

The Dauntless has done so well in this war that it is hard to decide which battle to tell you about. In the

**Douglas
Dauntless,
SBD-3**



first week of May, 1942, there was a big battle in the Coral Sea. Early in the morning of May 7 a scouting plane told the carrier *Lexington* that Japanese ships had been sighted. An attack group went right into the air. There were Grumman Wildcats, Douglas Dauntlesses and Douglas Devastators. The Devastators are torpedo bombers and we shall read about them later.

Soon the Japanese aircraft carrier *Shoho* was spotted by the Navy planes. The scouting Dauntlesses dove to attack. They made two direct hits. Then the bombing Dauntlesses dove and made five hits with 1,000-pound bombs. By this time the carrier was on fire. Then the Devastators, torpedo bombers, swooped down. They made nine torpedo hits.

The carrier *Yorktown* was not far away and airplanes came flying over from that ship. The Dauntlesses from the *Yorktown* came diving down from 18,000 feet and they made fourteen hits. More torpedo bombers rushed in and three minutes later the Japanese carrier sank. While this was happening, the

last dive bomber to attack saw that the carrier was sinking. He changed his aim and sank a Japanese cruiser.

Three Dauntless dive bombers were lost in the attack on the carrier. Our Wildcats shot down one Japanese scout bomber and three Japanese fighters.

This is the story of just one battle. Every day our fliers are doing brave things and every day the Douglas Dauntlesses are showing that they are strong and sure as dive bombers.

We all know that our carrier, the *Lexington*, sank the next day. Nearly all of the men were saved and many of the airplanes were put on the *Yorktown*.

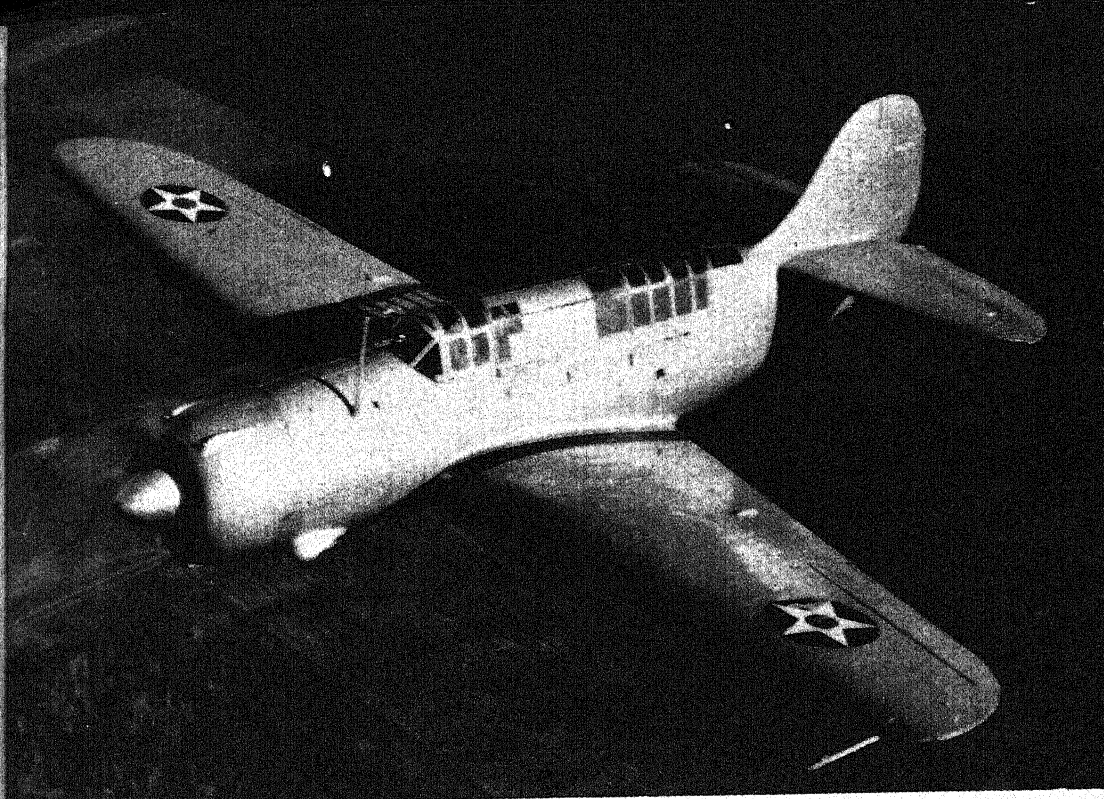
THE CURTISS HELLDIVER

Navy · SB2C-1

Army · A-25

The Curtiss Helldiver is the newest scout bomber in the Navy. We are told that it carries a larger load of bombs for a greater distance and at a greater speed than any other dive bomber. It is better than the German Stuka.

The Curtiss Helldiver is a two-seated, mid-wing monoplane with one engine of 1,700 horsepower. It can go 304 miles an hour and it flies as high as 25,400 feet. Its range is 1,200 miles.

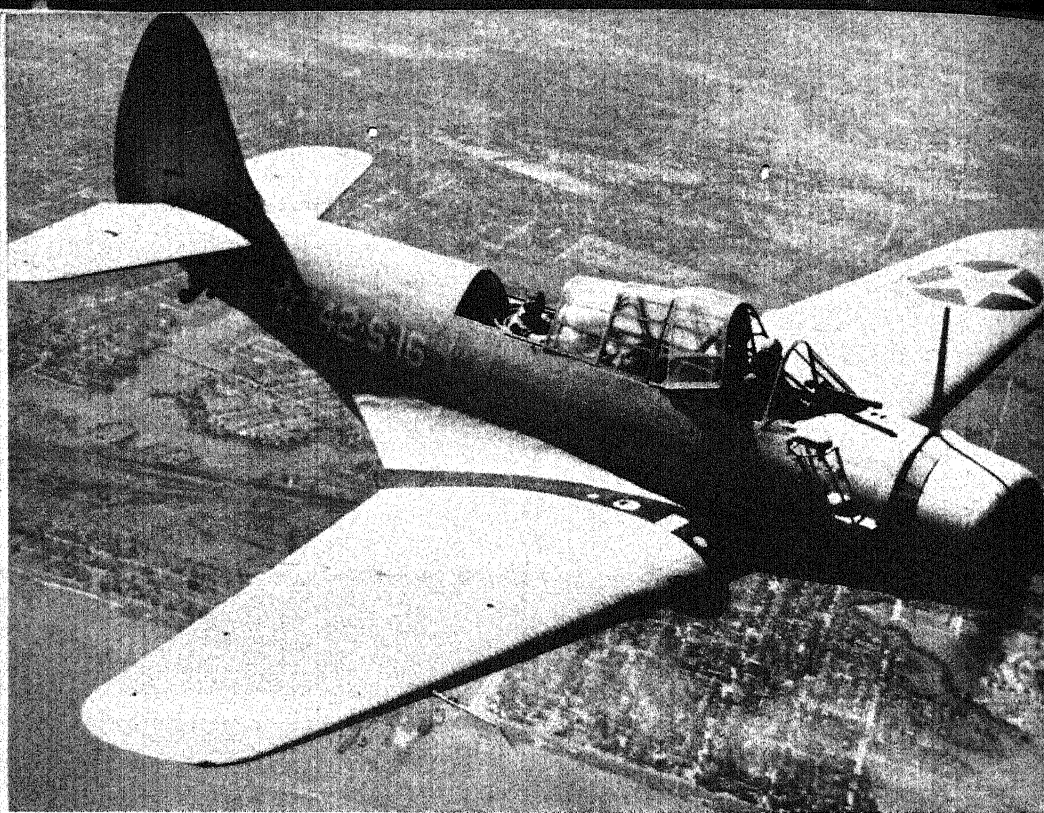


Curtiss Helldiver, SB2C-1

This airplane is a very good fighter. It has good armor and it has machine guns which are geared to fire through the propeller. There is another machine gun in the rear cockpit, and the plane can carry a bomb load of 500 pounds.

On January 27, 1943, the Army was given its first Curtiss Helldivers. The Army Helldivers are so like the Navy Helldivers that little changes could be made in the field and the plane could be used for either Army or Navy.

The Army will use the Helldiver as a light bomber for attacks. Its Army number is A-25.



Douglas Devastator, TBD

TORPEDO BOMBERS

THE DOUGLAS DEVASTATOR · TBD

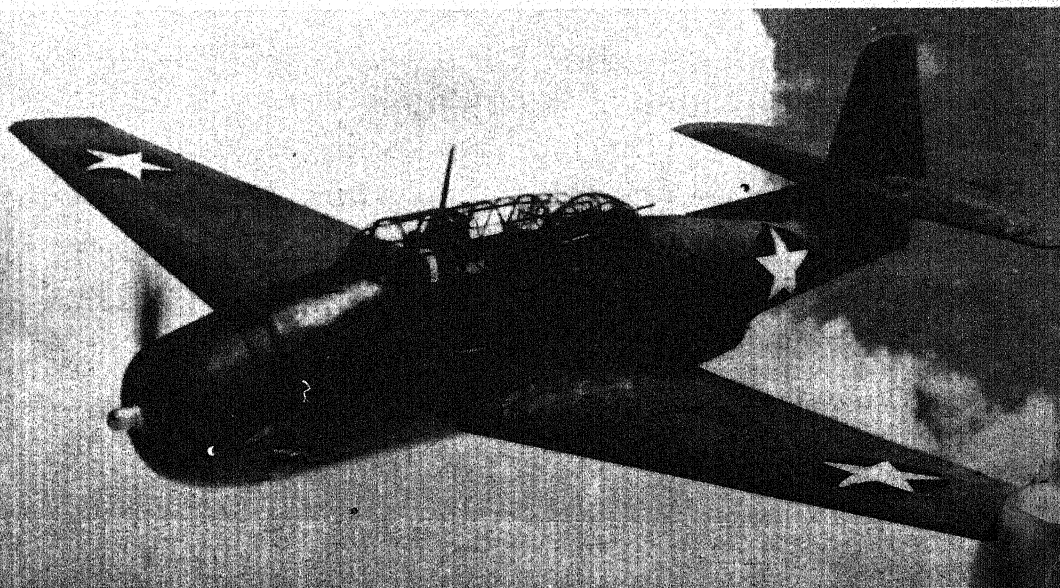
THE GRUMMAN AVENGER · TBF-1

Torpedo planes were not so important in this war until the British sank a great many Italian ships in one port. People knew that a torpedo hitting a ship under water could sink it faster than a bomb hitting from above. After the RAF used torpedoes against the Italian fleet, our Navy decided to use more torpedo bombers.

Until the battle of Midway Islands, our only torpedo bomber was the Douglas Devastator, TBD. This airplane is not used any more. It could not climb high enough for good speed-diving and it could not carry enough gasoline. One of the saddest stories of this war is the story of Torpedo Squadron Eight.

At Midway Islands on June 4, 1942, Torpedo Squadron Eight went into battle. The men of this squadron had never fought before. They had no fighter planes to protect them from the Japanese Zeros. They knew that they did not have enough gasoline to keep them flying until the dive bombers could attack with them. They knew that their Devastators were slow. But they went bravely into battle against Japanese ships and Zeros. Their leader was Lieutenant Commander John C. Waldron. He had said, "If there is only one plane left to make a final run-in, I want that man to go in and get a hit."

Grumman Avenger, TBF-1



Every man did go in. Zeros attacked from above and the enemy guns fired from ships. One by one each Devastator fell into the sea. At last one man, Ensign Gay, looked around and saw that he was the only one left. Even his radio man had been shot.

Ensign Gay's left arm had been hit by a bullet, so he held the stick between his knees. He dived right at a carrier, and with his right hand shot out a torpedo. He skimmed the carrier's bow ten feet away. Four Zeros dived after him. A shot hit his plane and sent him crashing into the sea.

Ensign Gay was able to crawl out of the plane and come up to the top of the water. He found a black rubber pillow floating and he hid with it over his head. The Japanese ships nearly sailed over him.

A few minutes later the dive bombers from his own carrier attacked the Japanese. The bombers attacked for two hours and they sank or crippled all the boats.

The next day Ensign Gay was picked up by a PBY patrol boat.

He was the only man left in his squadron. In its first battle all fifteen planes were lost and twenty-nine men. Torpedo Squadron Eight had done fine work. It was the first to find the "lost" Japanese fleet. It had stopped many Japanese airplanes from getting off the carrier to fight. It had kept the Zeros busy so the American dive bombers could attack. And it had hit several Japanese ships.

But the loss of the brave men of Torpedo Squadron Eight is something that we can never forget.

We have a better airplane now than the Douglas Devastator, the Grumman Avenger, TBF-1. It is the only torpedo bomber used by the Navy. This plane was kept a secret, and when it went into battle at the Midway Islands, it was a great surprise to the Japanese.

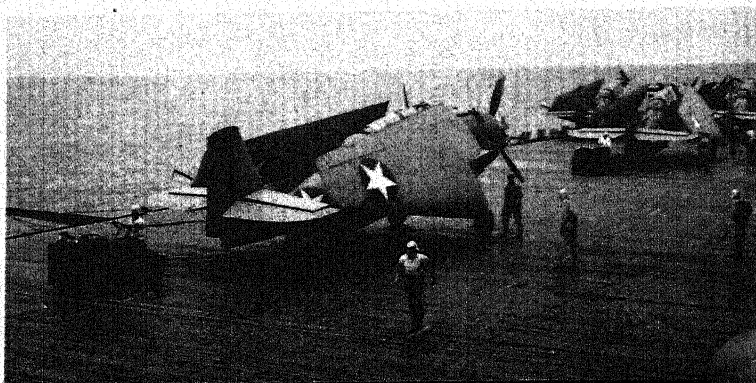
It is a mid-wing monoplane with places for three men. There is a gun turret behind the cockpit on top. Under the fuselage there is a gun to protect the rear. The Avenger carries its torpedo inside the plane and it can carry a torpedo that weighs a ton. Instead of a torpedo, it can also carry a ton of bombs and it can work as a precision bomber using the Navy's very fine bomb-sight.

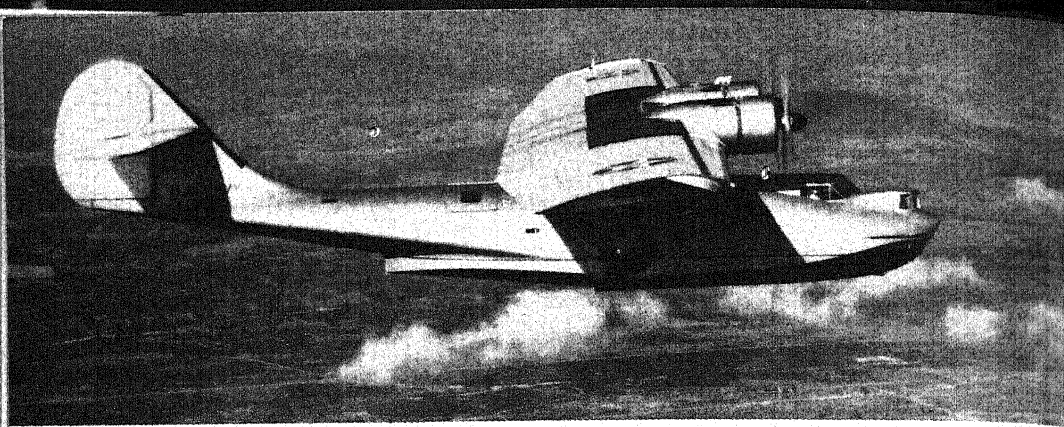
Like the Wildcat, the Avenger has folding wings. With its wings folded it takes up much less space in a carrier. The Avenger also has retractable landing gear.

This airplane goes over 270 miles an hour and it flies as high as 20,000 feet. Its range is about 1,400 miles.

Since it has joined the Navy the Grumman Avenger has proved itself a very fine torpedo bomber. Many people think it is the best torpedo bomber in the world.

**G r u m m a n
A v e n g e r s o n a c a r -
r i e r d e c k , t h e i r
w i n g s f o l d e d t o
s a v e s p a c e**





Consolidated Catalina, PBV-5

PATROL BOMBERS

THE CONSOLIDATED CATALINA · PBV-5 THE CONSOLIDATED CORONADO · PB2Y-3

Patrol bombers are the biggest of all Navy bombers. They are really big boats with wings. They must patrol the seas looking for enemy raiders. These heavy bombers are not built for speed. They are built to stay long hours in the air and they must be able to land on rough water. They fight with machine guns, bombs, torpedoes or mines.

One of the best-known patrol bombers of the Navy is the Catalina. This is a high-wing monoplane with its wings and two engines above the hull. The wings are flat, with no dihedral slant. When it lands on water, the wing-tips come down to make pontoons that help it to float.

This bomber can fly as high as 25,700 feet and it can go as fast as 198 miles an hour. It has a range of more

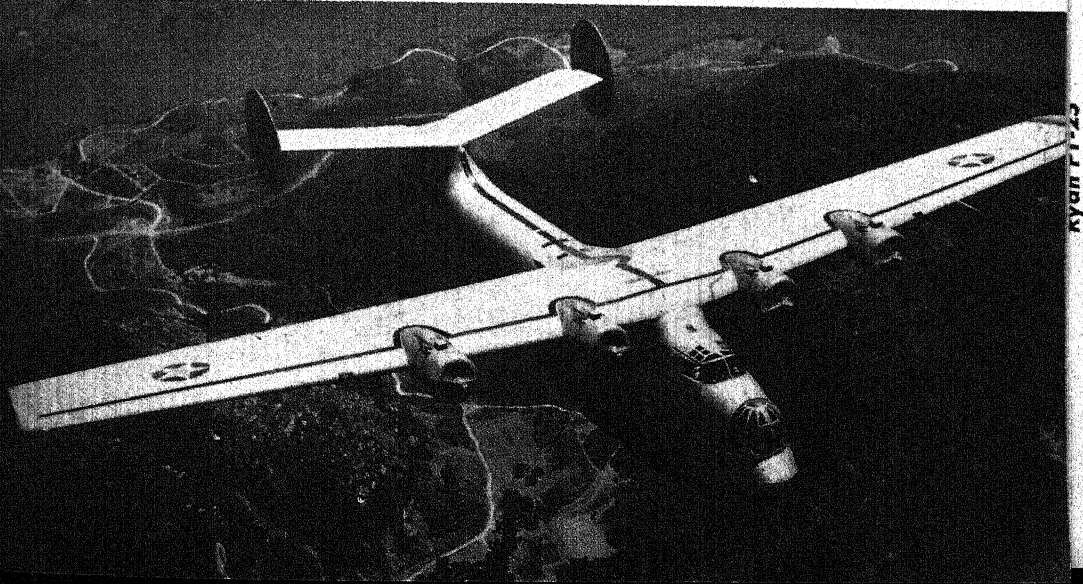
than 3,000 miles. It carries a crew of six men with supplies for long trips.

The Catalina has been very useful all through the war. It has been able to do many kinds of work. One man who came back from Alaska said that he saw Catalinas flying long distances watching for the enemy, trailing Japanese ships, fighting Zeros and submarines, carrying supplies and troops and even doing the work of five bombers.

When the Japanese first landed at Kiska, a Catalina on patrol saw them. After that the Catalinas flew back and forth on bombing trips. In the first two days they flew as many as nineteen hours out of twenty-four. The Navy Department sent out a special word of praise for the PBV crews who had fought so stubbornly.

The Catalinas of Patrol Wing Four attacked and sank several submarines. One submarine was hit at such close range that the blast knocked a hole in the

Consolidated Coronado, PB2Y-3



left wing of the Catalina. It also stopped one engine, but the Catalina flew 300 miles home to Dutch Harbor on one motor.

Another Catalina had its rudder cables shot away, but it would not stop its fight with some Japanese Zeros. It drove off the Zeros and then landed safely in the sea.

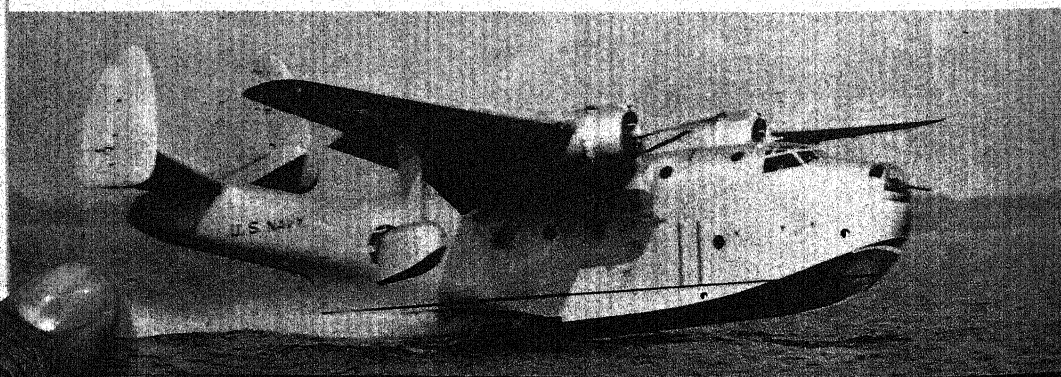
The Catalina is doing good work, also, in the Pacific, and we all remember that it was a Catalina that finally tracked down the German battleship *Bismarck* earlier in the war. The Consolidated Company makes another patrol bomber for the Navy. The Coronado is bigger than the Catalina. With its four engines it has a top speed of 225 miles an hour and a range of 3,700 miles carrying a load of 5,000 pounds of bombs. It flies well at 18,000 feet.

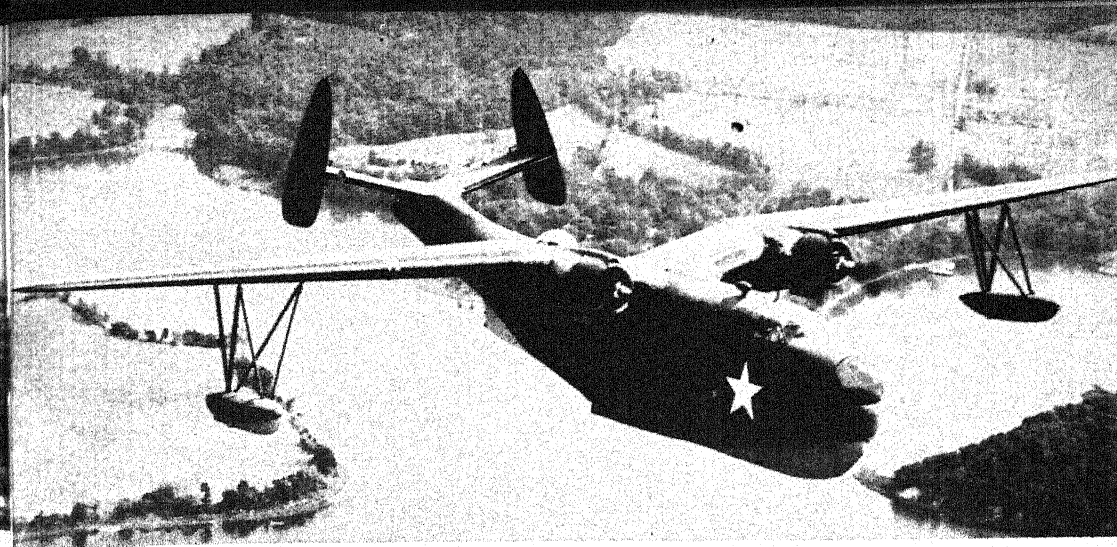
The Coronado is a deadly fighter. Besides its large load of bombs it has a power-driven gun turret on top, and guns in its nose, tail, sides, and bottom.

This big bomber carries a crew of seven men. It has beds for all of them and even a kitchen.

The Coronado can fly across the ocean and it can stay in the air twenty-four hours at a time.

Martin Mariner, PBM-3





Martin Mariner, PBM-3

THE MARTIN MARINER · PBM-3

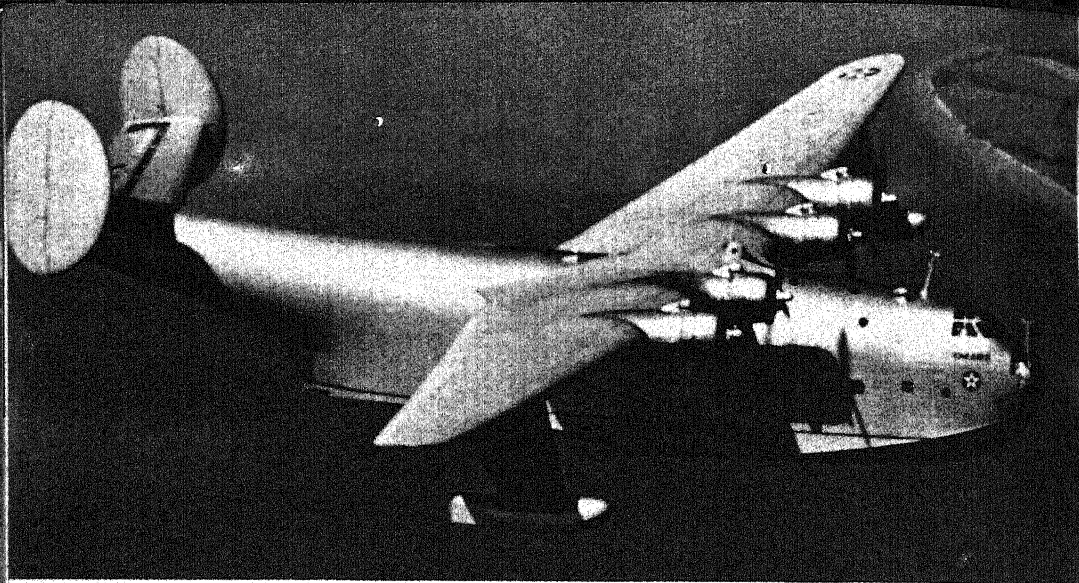
THE MARTIN MARS · YPB2M-1

Two Navy patrol bombers are made by the Martin Company. The Martin Mariner is one of the newest bombers. It is a monoplane with gull wings. It has two engines of 1,600 horsepower each.

This airplane has very good armor and great power for fighting. It has five gun turrets and it can carry several tons of bombs or two twenty-one-inch torpedoes.

In the hull there is a comfortable space for the crew of seven men, with beds and kitchen. This patrol bomber is able to work for weeks away from its real base, getting its gasoline and supplies from some far-off base or small Navy ship.

Another Martin patrol bomber is the Martin Mars YPB₂M-1. This is a giant bomber which is an experiment like the B-19. It is one of the largest airplanes



Martin Mars, PB2M-1

ever built. If the wings could be taken off and stood up on one tip they would reach as high as a twenty-story building. The wings are so thick that they have a hall going through them. The engineer can take care of the engines while the plane is flying. The Mars carries a folding lifeboat with an outboard motor. It also carries a number of rubber rafts.

The hull of this big flying boat has as much space as any sixteen-room house usually has. It has two decks inside with plenty of room for its crew of eleven men. There are sleeping rooms, sitting rooms for the officers and the men, two dining rooms, a kitchen and two shower baths. The head officer has a room of his own on the bridge.

The Martin Mars could carry 150 armed men all the way to Europe and back again without stopping for more gasoline.

THE NAVY VEGA VENTURA · PV-1

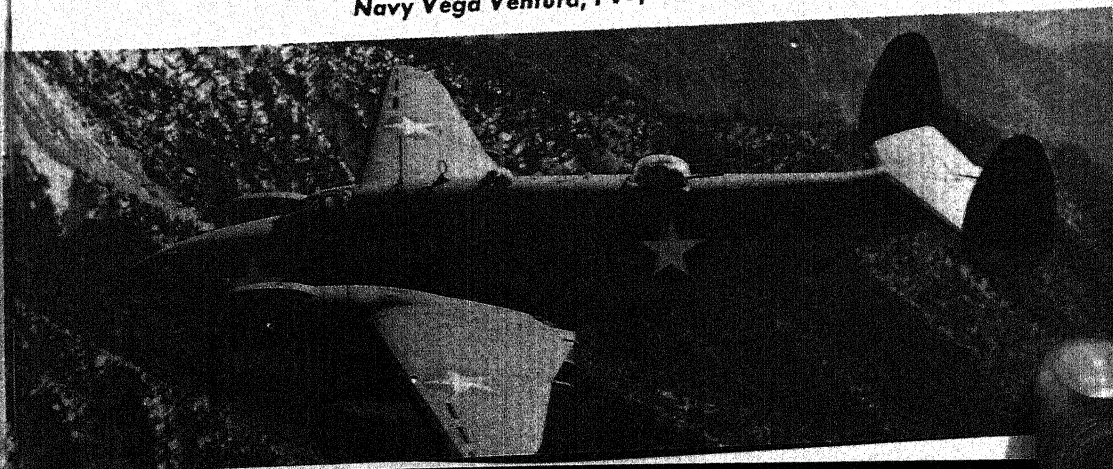
We have read about the Army Vega Ventura. This airplane is also one of the newest fighting planes of the Navy, the PV-1. It is the first land-based patrol plane of the Navy with a long range, good armor and enough guns.

It is like the Lockheed Hudson but the RAF says it is "fiercer, farther and faster." It has a large bomb bay for carrying depth charges and torpedoes. It can carry a heavier load than the Hudson and its cruising speed is close to the top speed of the Hudson. It has more radio equipment than any plane ever made by Vega or Lockheed.

The Navy's Ventura carries two extra gasoline tanks attached to the wings. These tanks, which can be dropped when they are empty, give the Ventura a longer cruising range than any other high-speed plane in the Navy.

The Ventura has two engines of 2,000 horsepower each. It can fly well over 300 miles an hour and higher than 25,000 feet. It will land under eighty miles an

Navy Vega Ventura, PV-1



hour and it can land in places where there are not long runways.

The Ventura has good armor for its crew. It carries a crew of four men. We do not know exactly how many guns it has but we do know that there are machine guns in the nose and several in the wings.

The pilots expect to find the Ventura just as useful to the Navy as it has been to the Army. Beside the Ventura, the Navy is now using other big land-based airplanes. The Navy has Liberators (PB4Y) and Mitchells (PBJ) and other land-based planes that we have read about. Navy fliers are finding these planes very useful for patrol work.

SCOUT OBSERVATION PLANES

THE CURTISS SEAGULL · SO3C-1

THE VOUGHT-SIKORSKY KINGFISHER · OS2U-3

Scout observation planes must find the enemy and lead the warships to meet him. They must also tell the ships by radio whether or not the big guns are making hits. They help the guns to get the right range. Often they are used to lay smoke screens.

Some scout observation planes have wheels. These planes use carriers for their bases. Other scout observation planes have floats instead of wheels. These planes are shot from catapults on battleships or cruisers. They



Curtiss Seagull, SO3C-1

are picked up from the water by cranes with hooks and pulleys.

The Navy has two markings for the scout observation planes. VSO planes have folding wings so they can be stored easily in ships. VOS planes have stiff wings which do not fold.

One of the newest of the observation planes is the Curtiss Seagull, SO₃C-1. It is a mid-wing monoplane with places for two men. Some Seagulls have floats and are used on battleships and cruisers. Others have wheels for land or carrier bases.

We do not know just what the Seagulls can do because that is a secret, but we do know that they are fast and have a long range.

Another important observation plane is the Vought-Sikorsky Kingfisher, OS₂U-3. This plane, too, is a two-seated, mid-wing monoplane and it can be made into either a land or a sea plane. We know very little about it, but we do know that it can fly at 171 miles an hour.

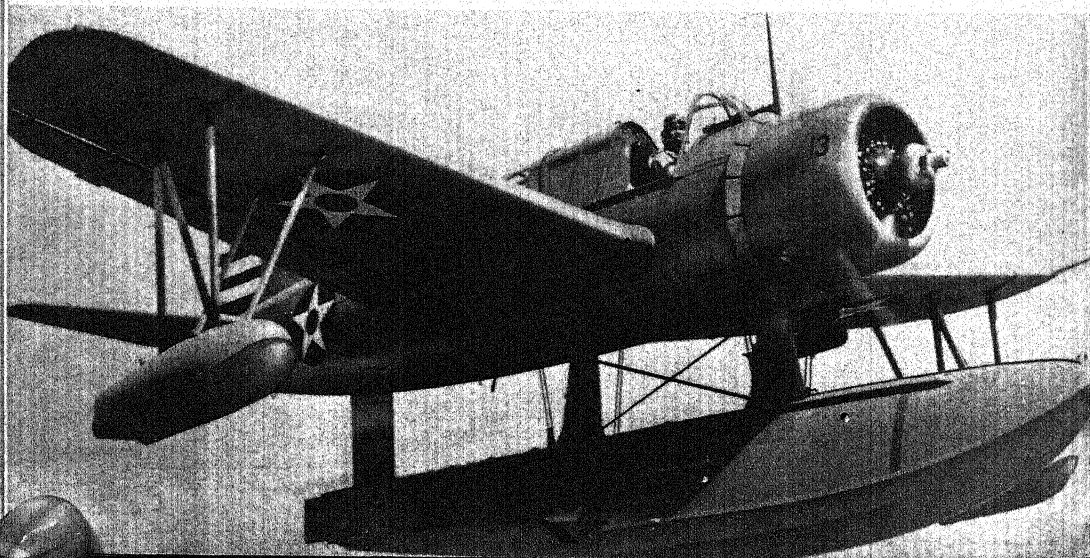
The Kingfisher has done very good work against German submarines, but we probably remember it because it saved Captain Rickenbacker.

On November 13, 1942, Lieutenant W. F. Eadie was flying a Kingfisher over choppy water in the South Pacific Ocean, 600 miles north of Samoa. Suddenly he saw a raft. Lieutenant Eadie brought his plane down on the water. In a little rubber raft, he found Captain Eddie Rickenbacker, Colonel Hans Adamson and Private John Bartek. These men had been drifting for twenty-one days.

The Kingfisher was made to carry only two people, but these three men were all pulled aboard. Colonel Adamson was very ill. He was taken inside the plane. Captain Rickenbacker and Private Bartek were strapped on the wings.

With this great load the Kingfisher was not able to fly, but it did a wonderful thing. It taxied over a choppy sea for forty miles. It landed everyone safely.

Vought-Sikorsky Kingfisher, OS2U-3





PART III

Miscellaneous





Boeing Caydet, N2S-2. Its Army number is Boeing PT-17

Chapter 7 · TRAINING PLANES

BEFORE a man can fly a real Army or Navy airplane he must learn to be a very good pilot. He must spend about nine months taking the Army or the Navy training course. While he is learning, he uses special airplanes. These planes have a seat for the student and one for the teacher, and they have two sets of controls. They are light and easy to handle, but they are very sturdy and strong. Training planes cannot fly very fast and so they are fairly easy to land. They have only a few simple instruments. Often these instruments are set in a panel of soft sponge rubber. This rubber instrument panel saves the pilot from being hurt if he makes a bad landing.

In the Army, beginners' airplanes are marked PT.

That means Primary Trainer. The Navy uses the letter N for first training. Some Army and Navy trainers are almost exactly alike. One of these is the Ryan PT-22. The Navy plane is called the NR-1. This primary trainer is a low-wing monoplane. The cockpit is open and the student has a seat. When seats are made like this, one in front of the other, we call them "tandem" seats. The landing gear is not covered and it does not fold up. The tail wheel can be turned to steer the plane.

Another primary trainer that is used a great deal is the Boeing PT-17. This is the N2S-2 in the Navy. It is called the Caydet. This airplane has two sets of wings, one above the other. It is a biplane. Like the Ryan PT-22 it is tandem-seated. The Caydet is a very sturdy plane. It is made so that it will not break up easily when beginners make poor landings. Most parts of the plane and of the engine can be reached quickly and easily by the mechanics so the plane can be kept fit for flying.

Another airplane is almost exactly like the Boeing PT-17. This is the Stearman PT-18. In the Navy it is the N2S-3. It is a biplane and is like the Caydet in every way except that it has an engine of a different make. The PT-17 has a Continental engine. The PT-18 has a Jacobs engine. Both are air-cooled. The PT-18 can fly about 124 miles an hour.

These three trainers are used by both the Army and

the Navy, but there are some other trainers used only by the Army and some that are used only by the Navy. One of the Army's trainers is the Ryan PT-25. This is a low-wing monoplane. It has an open cockpit with tandem seats.

There is one interesting thing about this trainer: it is made of plywood. No important metal is used except in the engine cowling. The cowling of an airplane is like the hood of an automobile. A plywood cowling would not be safe when the engine was hot. The engine of the Ryan PT-25 has 185 horsepower.

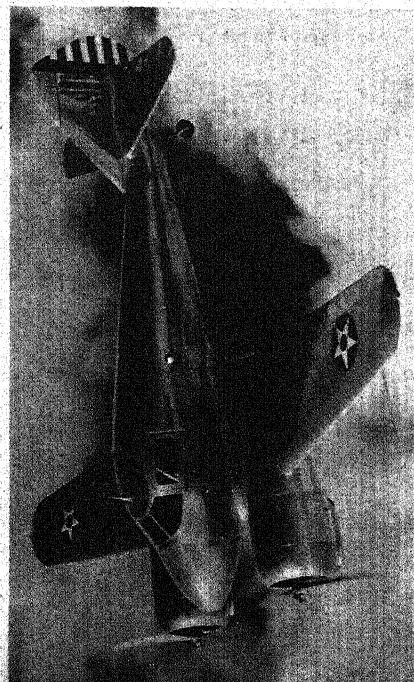
The Fairchild PT-19 is another important Army trainer. This plane has been used also in Canada. There it is called the Cornell. It is a low-wing monoplane with tandem seats. The engine of the PT-19 is air-cooled but instead of having its cylinders fixed like the spokes of a wheel, it has them in a line down the plane. This gives the plane a better streamline and makes it behave more like a real fighter plane. The PT-19 has a top speed of 135 miles an hour. It can fly for four hours without coming down for more gasoline.

An important Navy primary trainer is the N3N-3. This is made by the Naval Aircraft Factory. It is made in two forms—one with wheels and one with floats. The N3N-3 is used a great deal in all the Navy training bases. It is a monoplane with 225 horsepower.

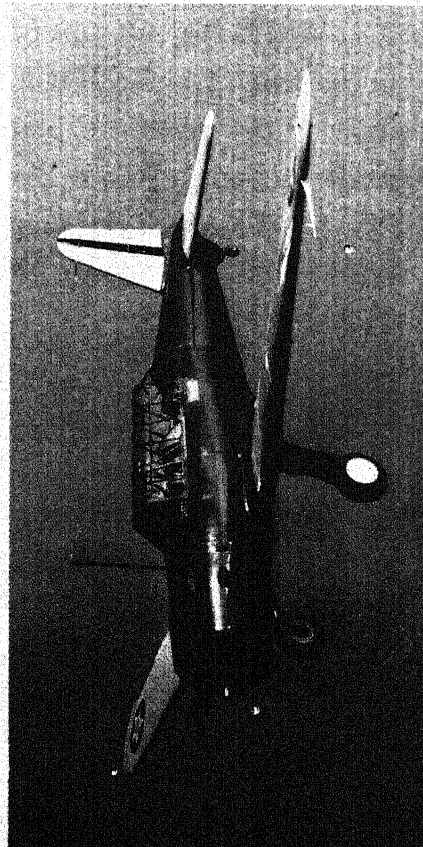
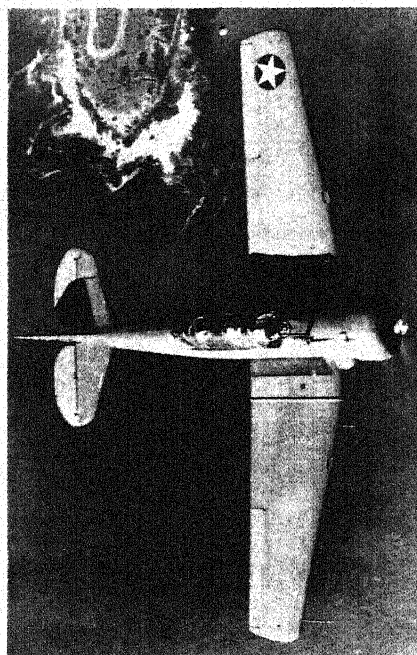
When a man has had about nine weeks of primary

TRAINING PLANES

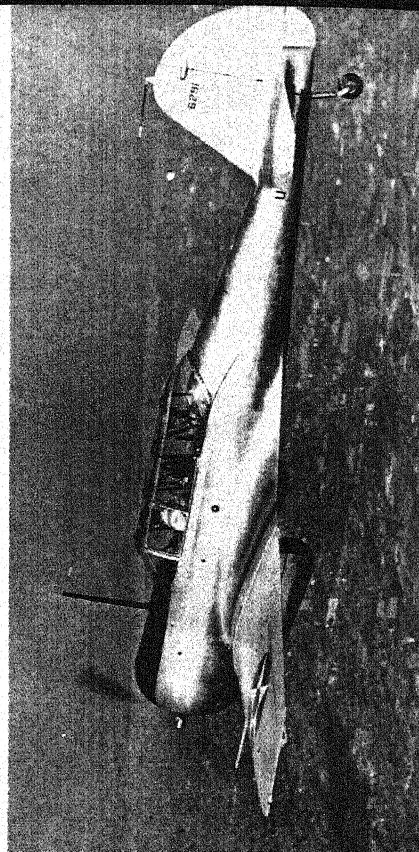
Curtiss Jeep, AT-9



North American Texan, AT-6

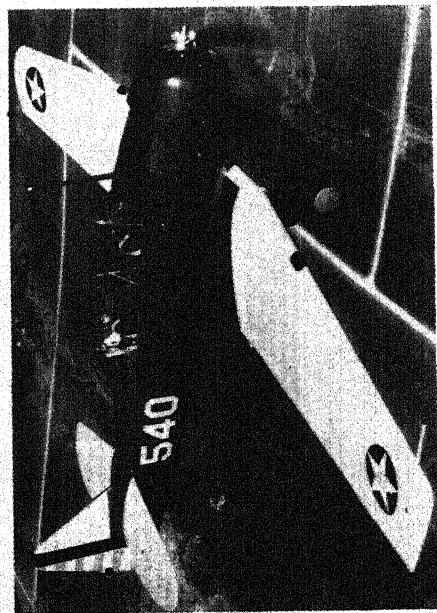


Vultee Valiant, BT-13, BT-15

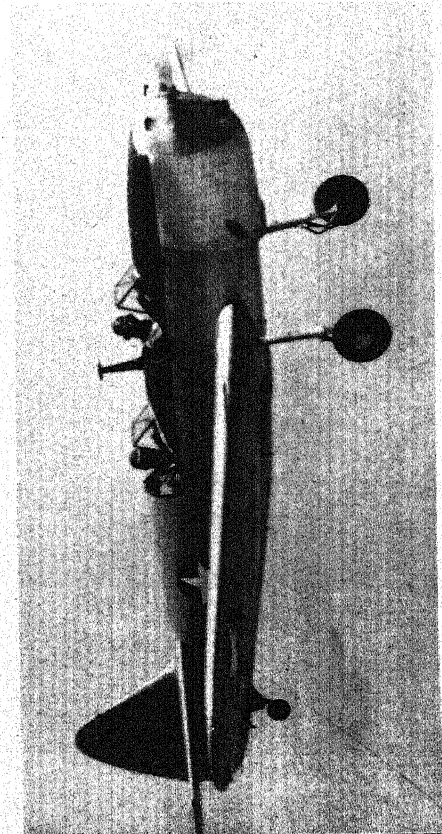


Navy Curtiss SNC-1

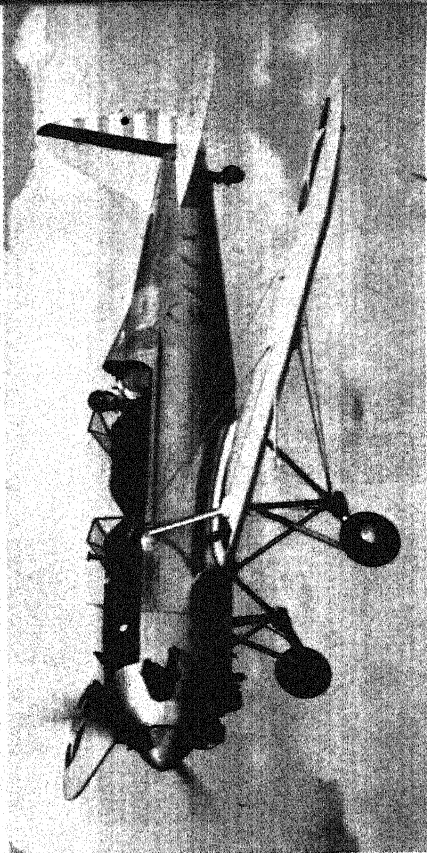
North American SNJ-2



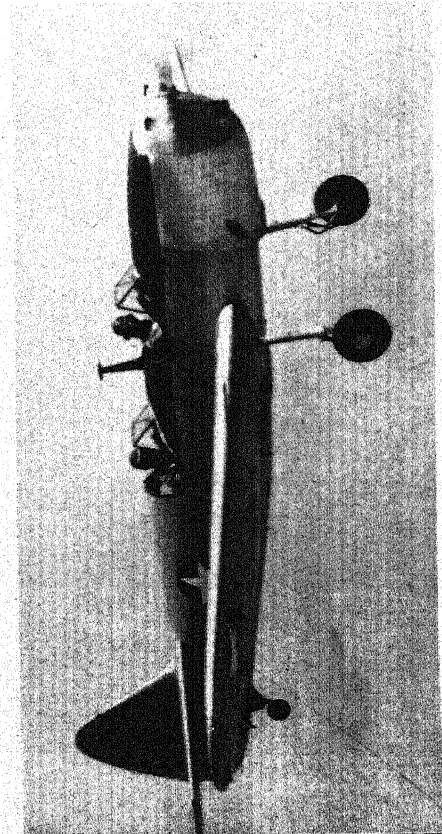
North American BT-14



Ryan PT-22

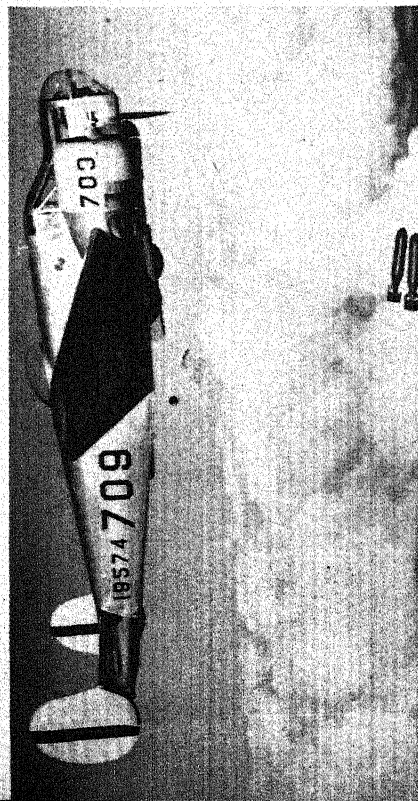


Ryan PT-25

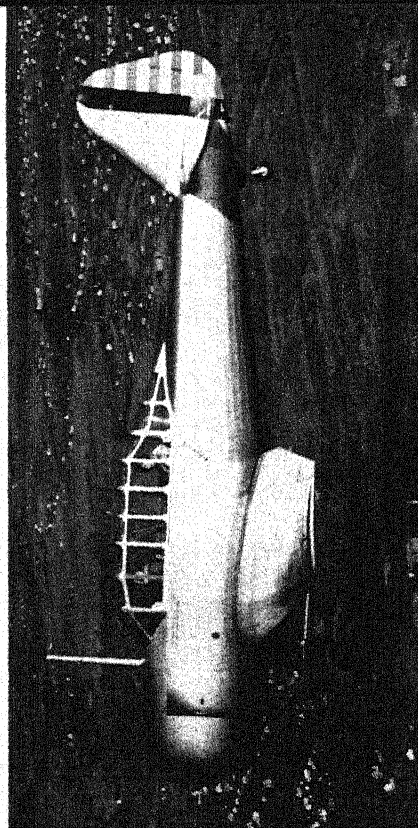


TRAINING PLANES

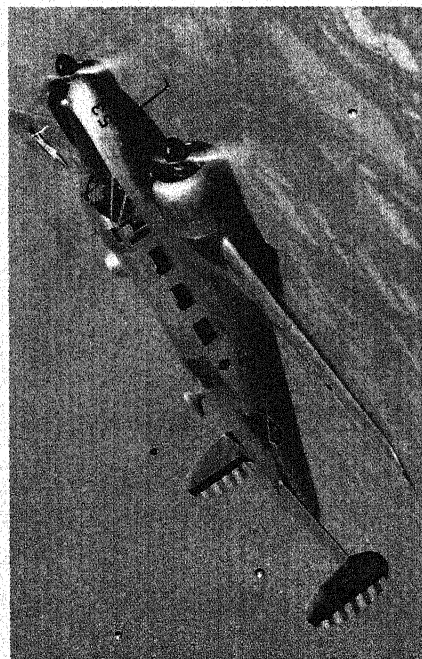
Beechcraft Kansas, AT-11



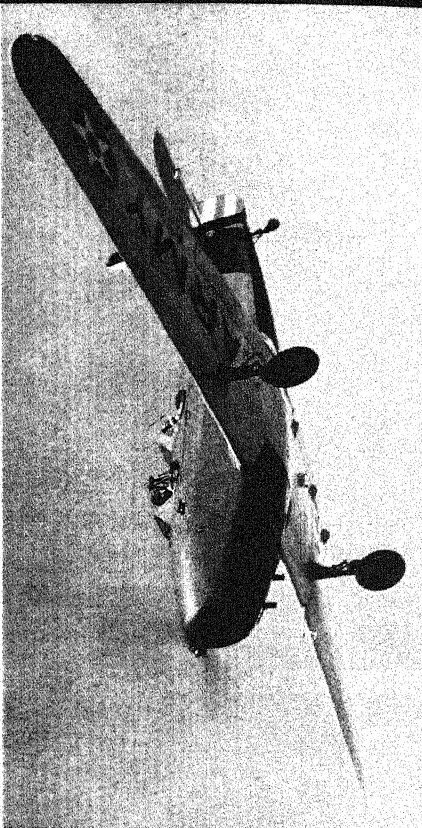
Fleetwings BT-12



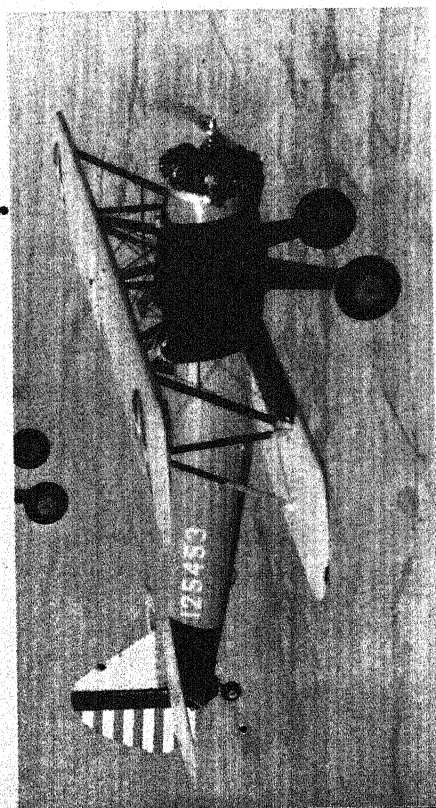
Beechcraft AT-7



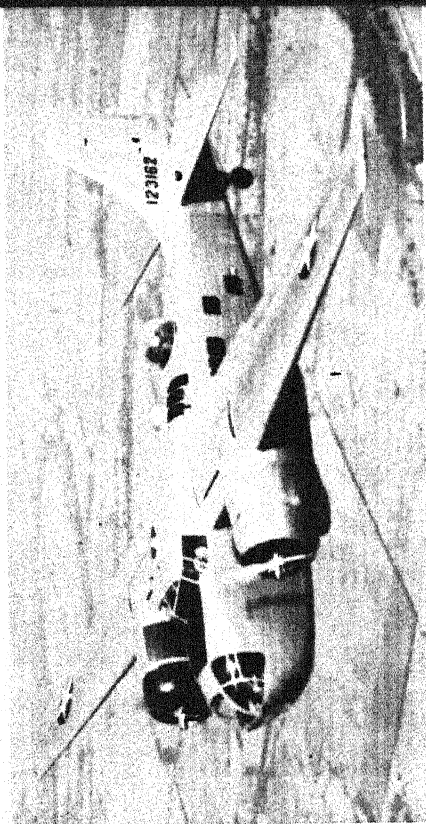
Fairchild PT-19



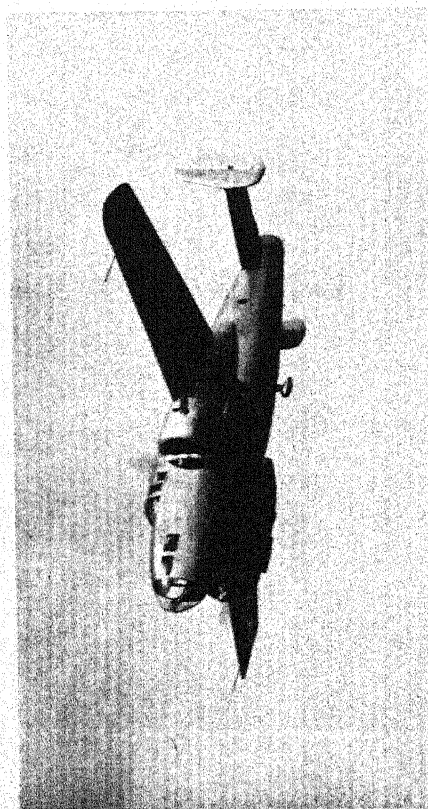
Boeing Caydet, N25-2. Its Army number is Boeing PT-17



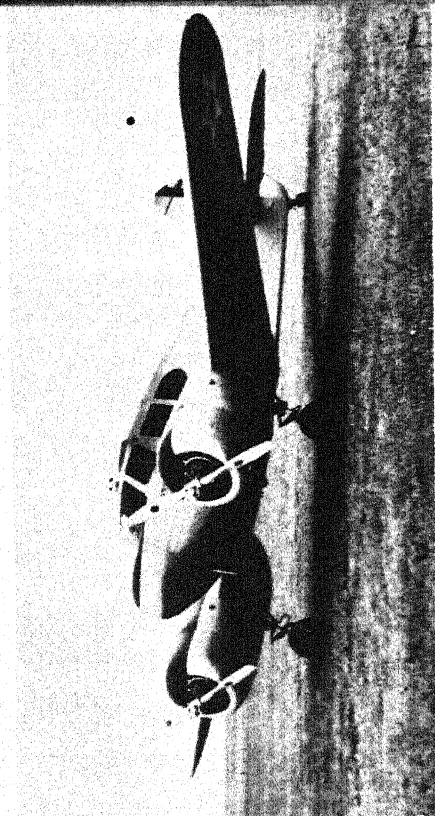
Boeing Crewmaker, AT-15



Fairchild AT-13



Cessna Bobcat, AT-17



training in the Army he goes on to the next grade. This is called basic training and it takes about nine weeks too. The Navy training is different because Navy pilots must learn a great deal about flying over the ocean. But even though the training is not exactly alike, both the Army and Navy use faster planes for the second grade.

One airplane used by both the Army and Navy is the Vultee Valiant. The Army letters are BT-13 and also BT-15 if the plane has a different engine. In the Navy it is the SNV-1. This is a low-wing monoplane with tandem seats. The cockpit is covered with plexiglass. The landing gear does not fold up. The Valiant has a range of more than 1,000 miles and a top speed of 182 miles an hour. It can fly at 21,000 feet in the air.

Another basic trainer is the North American BT-14. Someone has said that this plane has been used to train more Allied pilots than any other basic training plane. In Canada the BT-14 is called the Yale. This is a low-wing monoplane with tandem seats. It can fly 160 miles an hour and it flies at an altitude of 18,500 feet. Its range is 730 miles.

The Fleetwings BT-12 is another basic trainer in our Army. This is our only airplane made of stainless steel. It is a new model. It can fly around 23,800 feet and it has a top speed of 195 miles an hour and a landing speed of 58 miles an hour. It is a low-wing monoplane, tandem-seated, with a covered cockpit.

In the Army, when the basic training is over, a student goes into the advanced training stage. The advanced training also takes about nine weeks. The airplanes used in this training are very much like real warplanes. Some of these trainers have single engines and some have two engines.

One of the most famous of the advanced trainers is the North American AT-6. We call it the Texan. In the Navy it is the SNJ-2 and in Canada it is called the Harvard. More than 1,500 Harvards have been used by the RAF and the Royal Canadian Air Force. Our American air force uses it day and night to train our pilots. It is a low-wing monoplane, tandem-seated with a covered cockpit. It has an engine with 550 horsepower. It flies about 206 miles an hour but in dives it can reach 350 miles an hour. It carries one or two machine guns in the fuselage. The Texan was built to fly as much as possible like a fighter plane without costing so much.

Another important single-engine trainer is the Navy Curtiss SNC-1. It is called the Falcon. This plane can be used for all kinds of Navy training. It can be fitted with machine guns for gun training. It can be fitted with bomb racks and light bombs for bombing practice. It is also used for training in flying with instruments. The Falcon has a top speed of 215 miles an hour but it usually goes about 195 miles an hour. It flies well at an altitude of 2,500 feet.

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Another advanced trainer for pilots is the Curtiss AT-9, the Jeep. This is an Army plane. It was made so that pilots could have practice flying with two engines. Pilots say that it behaves very much like a larger fighting plane. The Jeep is a low-wing monoplane with its two engines far out in front of the wings and the fuselage. Each engine has 280 horsepower and the plane can fly more than 200 miles an hour. It carries four people.

Another twin-engine advanced trainer is the Cessna AT-17, the Bobcat. In England it is called the Crane. Its engines have 245 horsepower. Like the Jeep, the Bobcat has a long, covered cockpit. The front landing gear retracts part of the way but the tail wheel does not retract at all.

Not all of our airmen are pilots, however. In our big bombers we must have navigators, bombardiers, radiomen and gunners. The Beechcraft AT-11, the Kansas, is an advanced trainer for bombardiers and gunners. It is a low-wing monoplane with two engines. The nose of the fuselage is like a real bomber's nose. In the fuselage there are guns and bomb racks. There are enough places for teaching a crew of three or four men.

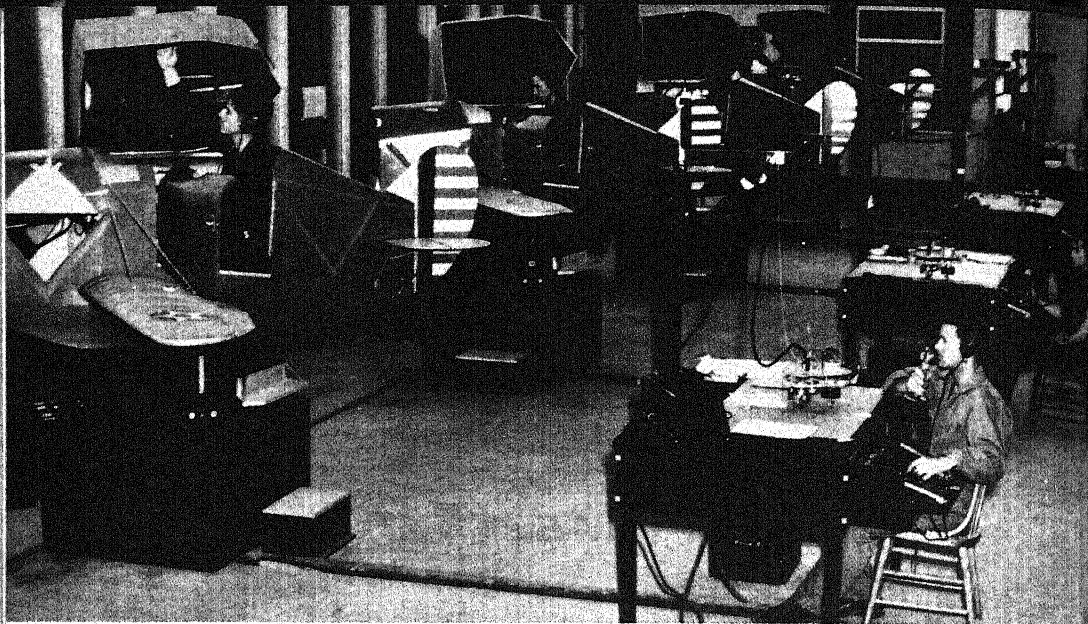
The Beechcraft AT-7 is a plane for training navigators. This is an all-metal, low-wing monoplane. It has retractable landing gear and twin rudders. It also has twin engines. This is the first training plane made

just for navigators. It has places for three navigators with chart tables and compasses and all their instruments.

The Army has found, however, that it is a fine plan to train the whole crew of a bomber together. This teaches the men teamwork. The Boeing AT-15, the Crewmaker, is like a small twin-engine bomber. This is our first trainer for a whole crew. It has a plexi-glass nose where the bombardier sits. It has all the instruments for the navigator and it has bomb racks and even a power-driven gun turret for the gunners. The plane is a high-wing monoplane with a top speed over 200 miles an hour.

Our latest crew trainer is the Fairchild AT-13. This plane is made of plastic. It has all of the instruments that any bomber crew needs: machine guns, camera, radio, bomb racks and navigation instruments. The AT-13 can fly over 200 miles an hour. It is one of our largest and fastest trainers.

These are not all of our Army and Navy trainers, but they are some of the most important. Even after using these advanced trainers, our pilots are not ready to meet the enemy. After the Army and Navy training courses are over, the new pilots are sent out to practice with Army and Navy groups using real warplanes. When they have had a great deal of practice, they are the real, full-fledged American fighting pilots who fly our fighters and bombers.



Link Trainers ready to start their "flights"

Chapter 8 · THE LINK TRAINER

WHEN you drive a car, you can look out and tell where you are by the houses and trees and signs that you pass on the road. You can even drive from one city to another by following a map. If you were flying a little airplane on a clear day, and if you stayed close to the ground, you could find your way on your map by looking out at the things you were passing over. But of course if you were flying a big bomber or a fast fighter plane you would not expect to stay close to the ground. You would fly in bad weather and even at night. Then you could not look down at the ground to see where you were. You would have to go by the instruments on your instrument panel.

Flying by instruments is not easy. Pilots must have a great deal of practice to learn how. We have in our country a wonderful thing for teaching pilots to fly by instruments. This is called the Link Trainer. In the Link Trainer a pilot can be taught to fly by instruments without leaving the ground. He does not risk his life while he learns and he can practice even when the weather outside is too bad for real flying.

The Link Trainer looks like a covered fuselage with small wings and ailerons and tail section. This small airplane stays on a square stand but it can turn all the way around and tilt up or down or sideways. It can even spin. There is a motor in the stand which makes the Trainer turn and move. Although the Trainer stays in one place, it feels to the pilot just like an airplane.

The cockpit looks like a real airplane, too. It has a pilot's seat and airplane controls and a lighted instrument panel. It has a two-way radio and all of the instruments that are used most for instrument flying. When the Trainer moves, these instruments show the changes just as if the airplane were really flying. There is an instrument called the Altimeter which shows how high the plane is flying, and other instruments to show speed and how much the plane is turning and banking. Another instrument tells the rate that the engine is turning around. This is called a Tachometer.

By watching the Tachometer the pilot can tell if his

engine is going at the right speed. Some trainers even have instruments which show the gasoline supply. These instruments show that the tank is getting empty and after a while when the gasoline is supposed to be all gone, they shut off the motor of the Trainer.

When the pilot climbs into the cockpit, pulls down the hood, and watches the instruments he feels as if he were flying on a real trip. As a matter of fact, he plans a trip with his teacher before he starts the Trainer. He follows his maps and watches the instruments and the teacher has a way of watching the trip, too.

There are two very important parts connected with the Trainer. One part is the Flight Log. It is often called the "crab." This is a small machine with three wheels. Two of the wheels are run by little motors inside. The third wheel is a round ink pad. The Flight Log is attached to the Trainer. As the Trainer moves, the Flight Log runs on a map, leaving an ink line to show the trip the pilot has taken.

Another important part of the Trainer is the teacher's desk. The map of the trip is always put on this desk and the Flight Log shows the teacher where the pilot is flying. There are also several instruments here for the teacher. There are two wheels with handles that look like coffee grinders. When the teacher turns them, he can make the Trainer behave as if it were meeting real wind. He can "grind" a heavy wind or a light wind

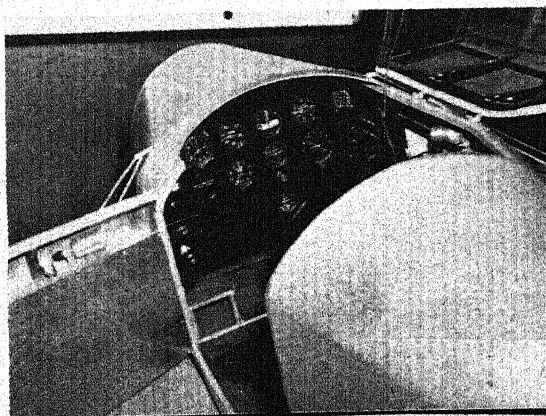
and he can make it come from any side he wants. He has an instrument that makes the Trainer fly through bumpy air and another to make the Trainer act as if it had ice forming on its wings. With these instruments at his desk, the teacher can give the pilot practice in flying in bad weather.

At the teacher's desk there is an instrument panel with instruments like those in the cockpit. These are attached to the Trainer. By watching them, the teacher can see just what the pilot in the cockpit is doing—whether he is climbing or making banks and turns.

The teacher's desk also has a two-way radio set so that the teacher can talk to the pilot or send him a message by Morse code. Another instrument is a radio sending set. With this the teacher gives the radio signals which a pilot would hear if he were flying along a radio beam into an airport. He can also make a light flash on one of the pilot's instruments when the plane is supposed to be flying over radio marker beacons.

With all of these instruments and a good teacher, a pilot can practice instrument flying almost as well as if he were going on a real trip. Just suppose he planned a flight from New York to Chicago in the Link

*Instrument panel of the
Link Trainer*



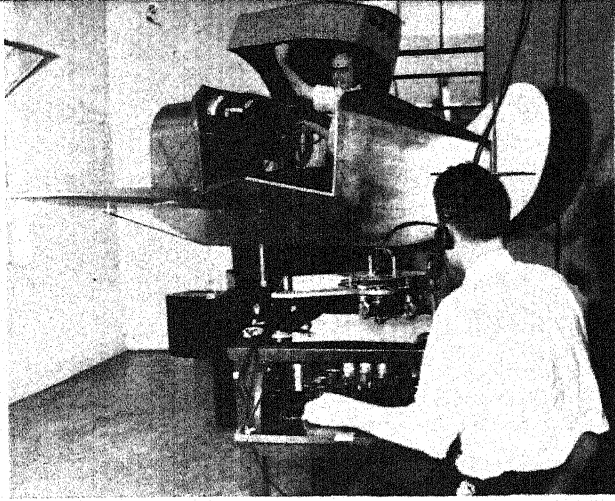
Trainer. He would find out from his teacher about the weather and he would study his map to see what places he would fly over. Along the way he would expect to pass radio marker beacons. These are radio stations on the ground which send signals straight up into the air. When a plane flies over them they make a sound on the radio or they flash a light in an instrument on the panel. When the pilot is in the Link Trainer, the teacher must watch the Flight Log very carefully so that he can give the signals as if the plane were passing over the beacons.

The teacher may also give the pilot some very bad weather and a strong wind. He may even make ice form on the wings.

When the pilot is near to Chicago the teacher must also give him the signals he would get if he flew into the airport along a radio beam. A radio beam is really a radio sending set at the airport. This set sends out signals in four directions. It is just as if you divided a circle of air into four parts.

In one part all the air is filled with the signal of the Morse code letter A (·-). It sounds like "dit-dah" to the pilot. In the next part the air is filled with the Morse code letter N (-·). It sounds like "dah-dit." The next part has the letter A again and the fourth part has the letter N. On the dividing lines of these parts, the letter A and the letter N overlap. That makes a steady buzzing sound. When the pilot hears the steady buz-

The Link Trainer. You can also see the "crab" making a record of the flight on the teacher's desk.

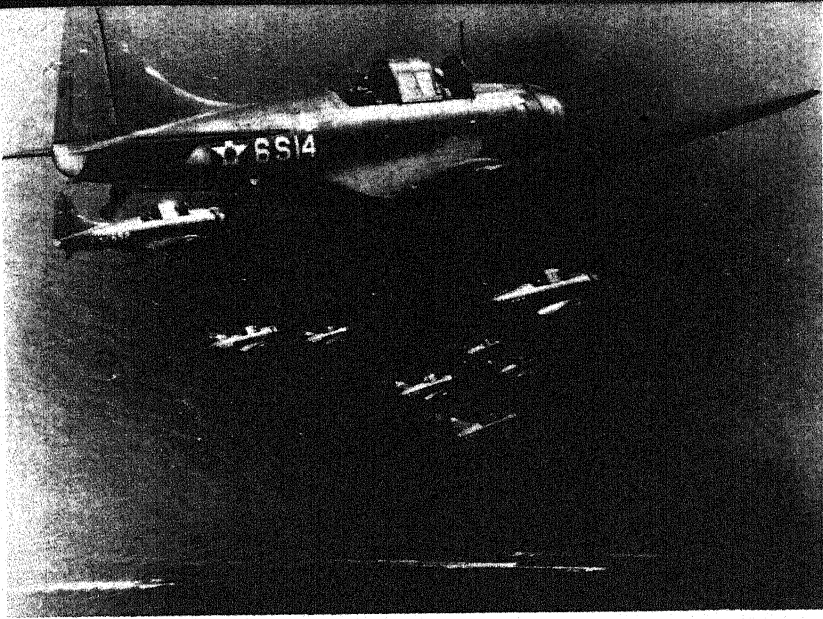


zing sound, he knows he is right on the radio beam. It gets louder as he goes nearer to the airport. Each half-minute the steady sound stops for the station's call letters so the pilot can be sure he is going into the right airport. If he gets off the beam he hears either dit-dah or dah-dit. Then he can easily look at his map, find the A part or the N, and see whether he should turn right or left to find the beam again. As long as the sound grows louder, he knows he is getting nearer the port. When he is right over the radio station in the very middle of the circle, there is no sound at all. This place is called the cone of silence.

By watching his instruments, the pilot can make a blind landing. When the trip is over, he shuts off the Link Trainer and raises the hood. If the Flight Log has stopped right at the Chicago airport on the map, the pilot has landed safely. The Trainer seems so much like a real plane that often pilots come out feeling very tired and worried—as if they had had a hard, dangerous flight.

One of the best things about the Link Trainer is that after the trip the pilot can study the map. He can see the ink line where he has flown and the teacher can explain his mistakes and help him. After he has practiced in the Link Trainer, he will be much safer when he flies by instruments in a real airplane.

The Link Trainer is used by our Army and Navy air forces and by the RAF. It is also used in many countries all over the world.

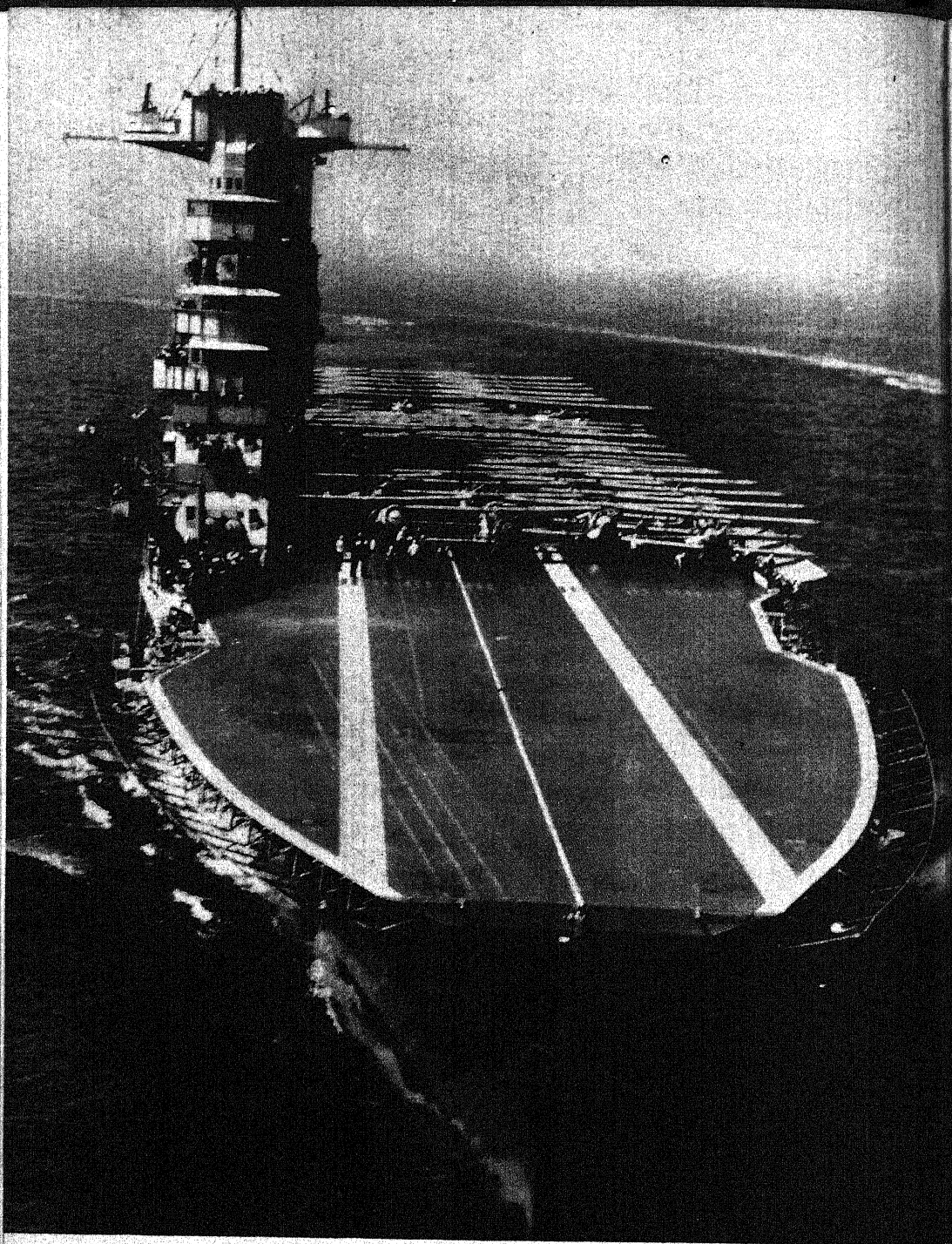


Dive bombers returning to their carrier

Chapter 9 · AIRCRAFT CARRIERS

WE have read so much about carrier-based planes that we should also know something about carriers themselves. Airplanes have changed our ways of fighting. Battleships used to be the best fighters on the ocean. Now a battleship cannot leave port unless its airplanes have control of the air. Boats cannot fight well against airplanes, so fighting planes have been taken on carriers to far parts of the world to protect the ships and to attack the enemy.

A carrier is a big ship. It may be from 500 to 900 feet long. Instead of battleship turrets, the carrier has a big, flat deck. Below this deck there is a large hangar deck. This is used for storing and repairing planes.



The aircraft carrier U.S.S. Saratoga

In the hull the ship carries bombs, torpedoes and bullets. It also carries the oil that it needs and a great supply of gasoline for the airplanes.

There are a great many men on a carrier. Besides the crew, there are the pilots and the mechanics who work on the planes. The total number is about 2,300 men.

Many people think that carriers are very helpless. This is not true. A carrier has big guns all along its sides, and some carriers can go as fast as thirty-four knots an hour. A knot is a little more than a mile.

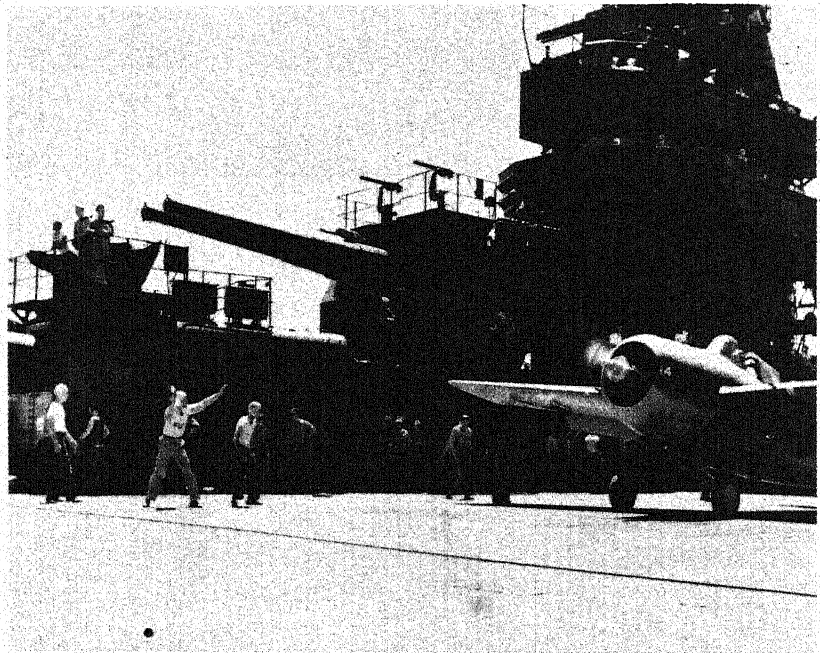
Although we have lost a number of carriers in this war, they were not sunk so easily as many people believe. Let us read what the Navy tells us about the sinking of the carrier *Lexington*.

At the end of the battle of the Coral Sea, the *Lexington* was attacked while her airplanes were attacking the Japanese ships. The *Lexington* was hit by two torpedoes and at least two bombs. That was the last action in the battle of the Coral Sea. The crew of the *Lexington* were able to put out the fires and save the airplanes. The *Lexington* steamed away when the battle was over, but several hours later she was shaken by a huge blast inside. This blast probably came from leaks in the gasoline tanks. It did not come from an enemy bomb.

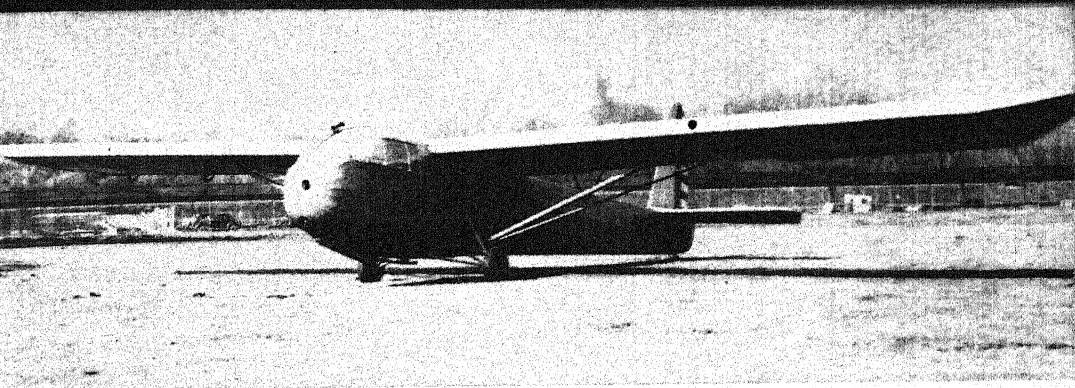
Fires broke out in several places. Every man worked hard to save the *Lexington*. Other Navy ships came

alongside and tried to put out the fires with their hoses. Finally, when the engines stopped working and the flames had spread everywhere, the captain ordered all the men to leave the ship. Many of the airplanes were put on the carrier *Yorktown*, and more than 95 percent—nearly all—of the men on the *Lexington* were saved.

The Navy is trying to build a great many more of these very useful carriers. Many merchant ships are being made over into small carriers.



Fighter plane about to take off from the deck of a carrier



Waco troop glider that carries nine men.

Chapter 10 · GLIDERS

GLIDERS are just coming into the Army and Navy air forces. They are used to carry troops and guns and cannons. A real transport plane can do this better than gliders, but there are not enough transport planes. Any bomber or patrol bomber could tow several gliders and that would take the place of a transport plane.

A glider is a light airplane without engines. The military glider is made to be towed. It cannot sail up into the air; it can only fly in tow, and then sail down quietly to land.

The Germans used large gliders for landing troops on the island of Crete. Some gliders carried twenty-three men.

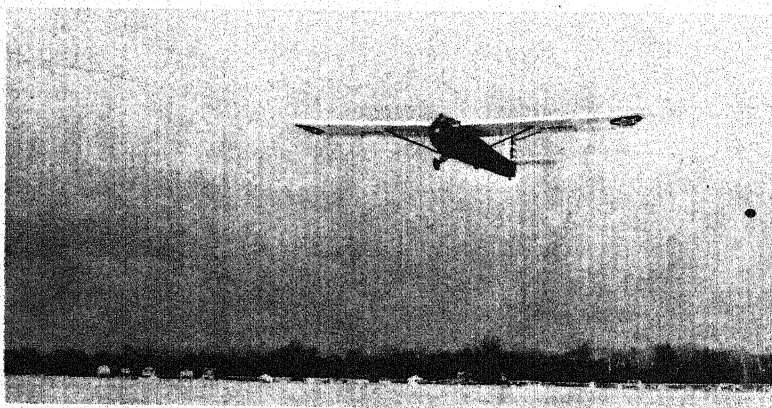
Sport gliders are very different from the air force gliders. If you like airplanes and like to make model airplanes, you would love to sail in a real glider.

The sail-plane glider is long and slim. It is so maneuverable that it makes you feel as if you were really flying.

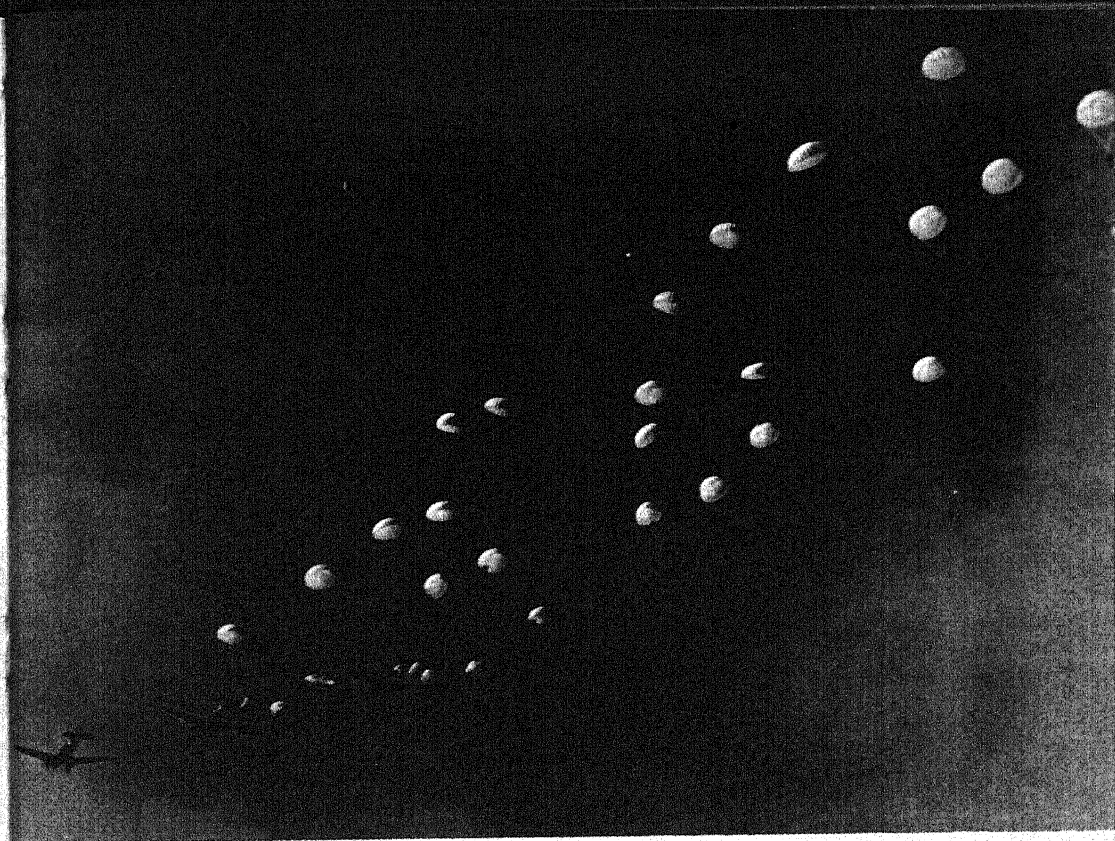
There are several ways of getting the glider up into the air. You may be towed along a road by a car, or you may be towed by an airplane. As soon as you are up, you drop the rope. Then you sail through the sky.

If you can find a stream of warm air going up, you can soar high in the air. You may even go up as high as 7,000 feet. It is fun to sail around feeling for another stream of warm air. You may stay up for hours at a time, and you may travel several hundred miles, or just come back to your own base.

People who like to glide say that it is very safe and much more fun than sailing in a boat.



Waco glider in flight. Notice the tow-line that attaches it to the plane that is towing it.



Paratroopers floating to earth after jumping from a big Army transport plane

Chapter 11 · PARACHUTES AND PARATROOPS

WE cannot leave airplanes without saying something about parachutes. Parachutes have been known for many years. Over two hundred years ago a man used a burning balloon as a parachute when he jumped for safety. And parachutes were known even before that. A parachute is really a very simple thing. It looks like a huge white umbrella with cords. The parachute which we use most today has five parts. The most im-

portant part is the big umbrella-bag. This is called the canopy. Another part is made up of long cords. These are called shroud lines. The shroud lines join the canopy to the third part of the parachute—the harness. The harness is made up of straps which hold the man in the parachute.

The fourth part of the parachute is the canvas pack. The whole parachute can be carefully folded and put in this canvas pack. The ripcord is part of this pack. When it is pulled, the pack opens.

There is a fifth part of the parachute which most people do not see. This is a very small parachute. As soon as the ripcord is pulled, this little parachute opens and it helps to pull the big parachute out of the pack. The little parachute is called the pilot chute.

The canopy of a parachute is made of strong raw silk, nylon, or pongee. It has twenty-four pieces of cloth in it. It takes seventy yards of cloth to make a twenty-eight-foot parachute. At the top of the canopy there is a hole eighteen inches wide. This is called a vent. It helps to make the parachute steady. The service parachute which is used most in the Army is twenty-four feet across the canopy.

There are twelve shroud lines. In the twenty-eight-foot parachute they are sixty feet long. These lines go over the top of the canopy and they hang with about sixteen feet of loose lines at the ends. By pulling at the shroud lines a man can steer the parachute.

*Do you see the small pilot chute
on the big parachute?*



The harness is made to keep the man from having too great a shock when the parachute opens. It braces his shoulders and his thighs.

Parachutes were used for a number of years in Russia and in Germany before our country saw how helpful they could be. Our pilots thought they were clumsy to wear. Some even thought it was rather "sissy" to wear them. But in 1919, after the parachutes had saved several lives, the Army ordered them for the whole air force.

The first Army flier to jump to safety was Lieutenant Harold R. Harris. On October 21, 1922, at McCook Field, Lieutenant Harris took up a new light monoplane. He was testing its wings. He met another plane in the air and practiced fighting. He banked and dove. Just as Lieutenant Harris was coming out of a

swooping turn at 150 miles an hour, he felt the stick begin to shake. He grabbed it and tried to hold it still. But the stick spun around with great force. The whole plane shook and parts of the wing tore off. The plane nosed into a dive.

There was only one thing for Lieutenant Harris to do. He had to try the parachute. He climbed out of the cockpit and fell away from the plane. Then he reached for his ripcord and pulled. Nothing happened. He pulled again. Still nothing happened. Lieutenant Harris was falling fast. All of a sudden he realized that he was pulling the wrong thing. He reached again and this time he pulled the ripcord. The parachute opened and Lieutenant Harris was saved.

This first parachute jump in the Army seemed very important. Within a month the Caterpillar Club was formed. This is not really a club at all. It is a list of names kept in the office of the U. S. Army air corps of people who have saved their lives by jumping with parachutes from falling airplanes. It is called the Caterpillar Club because the parachutes are made of silk. Lieutenant Harris is Caterpillar number one. Since 1922 the list has grown very long. There are thousands of fliers who have saved their lives by parachutes. Each



*Paratroops go into action
as soon as they land*

one of them must have an exciting story to tell. Parachutes are not only lifesavers. They are now being used to carry soldiers into a place for action. We have all heard of the work of the German paratroops in Holland and in Crete.

Today our country uses paratroops in the Army and the Marine Corps. The men in the paratroops are all well and strong. They must be between eighteen and thirty-two years old and they are all volunteers. This means that they are not drafted but they have asked to be paratroopers.

They go into very careful training. They are taught how to jump and how to land without being hurt. Landing can be a great jolt. It is like jumping from a platform twelve feet high.

Most of our paratroops pull their own rip cords. But when the air force wants to land men faster, it uses a static line. The static line is a line which opens the parachute as soon as it leaves the plane. This means that the men can be dropped as low as two hundred feet from the ground and ten men can be dropped in five seconds. If the paratroops are dropped near the ground, the enemy guns cannot aim at them so well.

Although America was rather slow in using parachute soldiers, it was the first country to carry paratroops from a great distance. When the second front was opened in Africa our parachutists were carried by airplane from England to Africa. This was 1,500 miles.

The paratroopers went aboard the airplanes early on a Saturday night. They flew without stopping for eight hours across Europe and the Mediterranean Sea. They landed at dawn on Sunday and were still fit for fighting.

We can easily see that parachutes are of great use in time of war. Some of the paratroops are ski soldiers. After they jump from the plane, their skis and guns are dropped down to them. In many countries doctors and nurses use parachutes to reach the battlefields quickly.

But when the war is over we shall still find a great many things to do with parachutes. They will still be of use to doctors who must reach people in far-off places. They will be good for men who fight forest fires and for dropping supplies to people stranded on mountains or islands. Parachutes will always be used to reach those in trouble far away from roads and ports.



Chapter 12 · THE FAMOUS “FIGHTING THREE”

EVERY day our fliers are fighting gallantly. It is not always fair or even easy to find one person to tell about. But there is one group of fighters that has fought many battles against great odds. This is a Navy squadron, VF-3. It is called the Fighting Three.

This is a squadron of fliers with Grumman Wildcats. Their first leader was Lieutenant Commander “Jimmy” Thach. Perhaps you would like to read about their first battle.

On February 20, 1942, the Fighting Three was steaming over the Pacific on the carrier *Lexington*. At

10:15 in the morning the news came that some airplanes were thirty-five miles away. Six Wildcats went off to scout around. Soon two of these, with Commander Thach, spotted a Japanese four-engine patrol plane. It was forty-three miles away but the Wildcats shot it down. Later in the day, another group of Wildcats shot down a second four-engine patrol bomber.

At 4:30 the battle really began. The Japanese had found the carrier *Lexington* and nine Japanese bombers came to attack. The Fighting Three sailed right up and intercepted the bombers. They knocked down five bombers in the first few minutes, and then three more. Only one bomber escaped.

While the first group of Japanese bombers was fighting with our Wildcats, another group of nine bombers came to attack the *Lexington*. There were only two fighters left on the deck of the carrier. Lieutenant Commander "Butch" O'Hare led these two planes up to meet the bombers. At the start of the fight, the guns of one plane jammed. Then Lieutenant Commander O'Hare attacked the nine bombers all alone. In a few minutes he shot down five. Three more bombers were knocked out by some of the other Wildcats. Only one flew away, but it was badly damaged.

The score at the end of the day was a great victory for the VF-3. Two patrol planes had been shot down. Sixteen out of eighteen Japanese bombers were down and one other probably fell later. The VF-3 had lost

two Wildcats but one of the pilots was saved. No damage had been done to the *Lexington*.

We have read earlier about the Battle of the Coral Sea. Here the Wildcats fought along with the Douglas Dauntlesses and Devastators. All of the Wildcats from the carrier *Lexington* belonged to the Fighting Three.

This squadron has fought bravely in other battles, too. In the big battle of Midway in which Torpedo Squadron Eight was lost, the attacking Wildcats were the fighters of the VF-3.

Today Lieutenant Commander Thach is training more pilots. Lieutenant Gayler, who downed eight Japanese planes, is testing airplanes. But Lieutenant Commander "Butch" O'Hare is out in the Pacific leading the famous Fighting Three to more victories.

Chapter 13 · AIRPLANES IN THE BATTLE OF BISMARCK SEA

ON March 3, 1943, the Allied airplanes won a great victory in the Bismarck Sea. They sank or damaged a whole Japanese convoy of twenty-two ships.

The story of this battle mentions most of the fighting airplanes that you already know. It is interesting to see how each plane did its own kind of work. The Lightnings protected the bombers. The heavy bombers carried the biggest loads to the largest ships. In this battle Warhawks were used as attack bombers with Lightnings to protect them.

Australians also took part, but as we have not read about their airplanes, I have left them out.

Before dawn Australian pilots in American Catalina flying boats bombed a ship, and some Havoc planes attacked a Japanese airdrome on New Guinea. The Havoc, you know, is the same plane as the Douglas Boston, but it is made for night work.

At ten o'clock B-25 Mitchell medium bombers dropped their loads on some ships. P-38 Lightnings flew above them and shot down ten Zero fighters.

From ten to half past twelve a number of Flying Fortresses attacked the fleet. They were intercepted by Zero fighters, but they shot down about eighteen of the Zeros.

At 12:30 several P-40 Warhawks fought as light bombers. P-38's flew above them.

From three o'clock to half past seven the convoy was bombed by A-20 Bostons, B-25 Mitchells and B-17 Flying Fortresses. The P-38 Lightnings were in the air all afternoon. They fought very well as interceptors against the Zeros.

At the end of the battle, the whole convoy was gone. Our airplanes had shown again that they can be trusted as fighting planes.



Sikorsky Helicopter

Chapter 14 · SOME INTERESTING NEW THINGS

THERE are so many new things that have been made for airplanes in the last few years that it is hard to choose the ones to write about.

Men working in the factories have thought of many new ways of saving time. They found that waiting for paint to dry on airplanes took a great deal of time and painting the small parts took time, too. Now they have a way of getting it done faster. They hang the parts by wire on a little car that moves along a track over-

head. When this car is over a big tank of paint, the parts are lowered into the paint. After they have been dipped, they are carried along to a place where special lights are turned on them to dry them. These are called infra-red lamps and they dry the paint in seven minutes.

Another thing that saves time in the factory is a very short telephone line. The men working on the inside and the outside of a fuselage wear earphones and mouthpieces resting on their chests. They look like telephone operators. This little telephone line from the inside to the outside of the fuselage saves much time. The men can give each other directions without crawling to the opening of the fuselage to talk.

Most airplane factories have new machines that put in a great many rivets in just a few minutes and they have new machines for welding.

In the airplanes themselves, there are new things which make them fly better or go higher. We have an airplane wing which is very fine. This is called the Davis wing. Mr. David R. Davis, who first made it, worked seventeen years to find the best streamline for a wing. Have you ever noticed the shape of a drop of water? It looks a little like a pear. The water has no shape of its own. It is given this shape by the stream of air passing around it. No part of the water sticks out and pushes against the air. This is the most perfect streamline we know. If you could cut a Davis wing in

half, you would find that the shape of the cross-section is very much like a drop of water. The Liberator is the first airplane that we have built especially to fit the Davis wing.

Another new thing which helps flying is the use of two propellers turning in different directions. When an airplane is driven by one strong propeller it always feels a push to one side. It does not fly straight. It wants to make a wide curve. We call this push to one side the torque of the plane. On the Lockheed Lightning the propellers turn in different directions and there is no torque. Now airplanes with only one engine are using two propellers, one in front of the other. One turns to the right, the other turns to the left. These propellers help the airplanes to fly at high altitudes and without torque. They are called contra-rotating propellers. That means propellers that turn opposite each other. The nickname is contra-props.

The real thing that makes an airplane fly high is the turbo-supercharger. We have read about that before and we have read, too, about the new supercharged cabins. The Lockheed Constellation has supercharged cabins so that people will not notice the thin air when they are at high altitudes.

Flying very high has made people invent another new thing—a new kind of short-wave radio. In 1941, the radio man and people on the ground could talk to each other when the plane was up 19,000 feet. Above

that the radio-telephone did not work. The radio-telegraph worked up to 26,000 feet in the air. Above that the plane could hear the dots and the dashes but it could not send any.

Now engineers have made a wonderful two-way radio set. The radio man can talk to the ground people and he can hear them when he is six or seven miles up in the air.

Flying at such a high altitude has given engineers many other problems. One of these is the cold. A pilot can leave the ground on a hot summer day and find himself in a few minutes flying in the bitter cold. It is sometimes 160 degrees below zero at 35,000 feet. Engineers have found how to keep the oil running in the engines and how to keep the metal bars from breaking. Sometimes one bar of metal would be red hot by the supercharger and six inches away it would be about 120 degrees below zero.

Another problem is ice on the wings of the planes. Most airplanes have rubber de-icers, but some have the new hot-wing de-icer. We have read in the chapter on the Lockheed Constellation about this de-icer.

Another new thing is the kind of gasoline used by airplanes. This is called high octane gasoline. A new high octane gasoline is being made now. This gasoline will drive a plane much farther on a gallon. The men who make this gasoline at the Socony-Vacuum Oil Company say that it will make a fighter plane climb

faster and fly farther. Bombers will be able to get off the ground with a heavier load and they will be able to travel farther. They will not have to carry so much gasoline, so they will be able to carry more bombs.

We have read about several other new things before. There are self-sealing gas tanks, bulletproof glass, and wonderful automatic pilots that pull the airplane out of a dive even if the pilot has a blackout. Now there is, also, an automatic pilot seat. This seat leans back very slowly as the plane dives. When the time comes for the pilot to lose his senses, the back of the seat is flat and the pilot is lying down. Often this keeps him from having a blackout. When the plane climbs again, the automatic pilot seat becomes straight.

We cannot begin to tell of all the new things that have been made for airplanes. We can hardly tell of all the new airplanes themselves. We have read of a great many and some of them are very large. Did you know that a very small airplane has been made?

This airplane is called a Helicopter. Mr. Sikorsky has been working on it for years. It has no wings on the sides. It has a large propeller on top and a small one in the rear. These propellers are called rotors. The Helicopter can stop in the air and stand still. It can back up or go sideways or forward. It can be parked in a parking lot with automobiles or it can light on water. It can fly at eighty miles an hour and it uses only one gallon of gasoline to go fifteen miles.

Now we are using Helicopters for the protection of shipping convoys. Because they can land and take off from the small space on a ship's deck, they can travel all the way across the ocean with the convoys. They are useful for dropping bombs on submarines.

Mr. Sikorsky thinks that when a lot of Helicopters are made they will cost only as much as a medium-priced car. After the war, perhaps, you will drive to work or to school in a Helicopter.

After this war is over, we must all keep right on thinking of new things. We cannot sit back and rest. We must try to be unselfish. We must try to work well together and we must work hard. There will be a great deal for us to build up again, a great deal for us to mend, many people for us to help.

We shall turn our warplanes into peace planes. Our farmers will use them to sow seeds over our great western plains and they will use them to spray the crops. Our big transports will carry loads of freight from one city to another and to far countries across the earth. Food and clothes and medicine will be rushed by plane to all the people who are hungry or cold or ill.

And we shall go traveling. We shall meet people all over the world and see wonderful places across the ocean. Airplanes have brought all the countries close together. Did you know that you can fly from New York to Moscow in less time than you can go by train from New York to Miami? If you fly across the Arctic

Circle, you save many hours and miles of traveling. By this northern route, you can leave Chicago and reach Bombay in thirty hours. You can fly from Minneapolis to Tokyo in twenty-three hours. A trip from New York to London could be made overnight.

Airplanes have made the world seem very small. After the war we will all have to live on this earth together. We will use these airplanes to do our work, to protect everyone's peace and to fly on trips of kindness and mercy. And *you* may be the pilots!



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